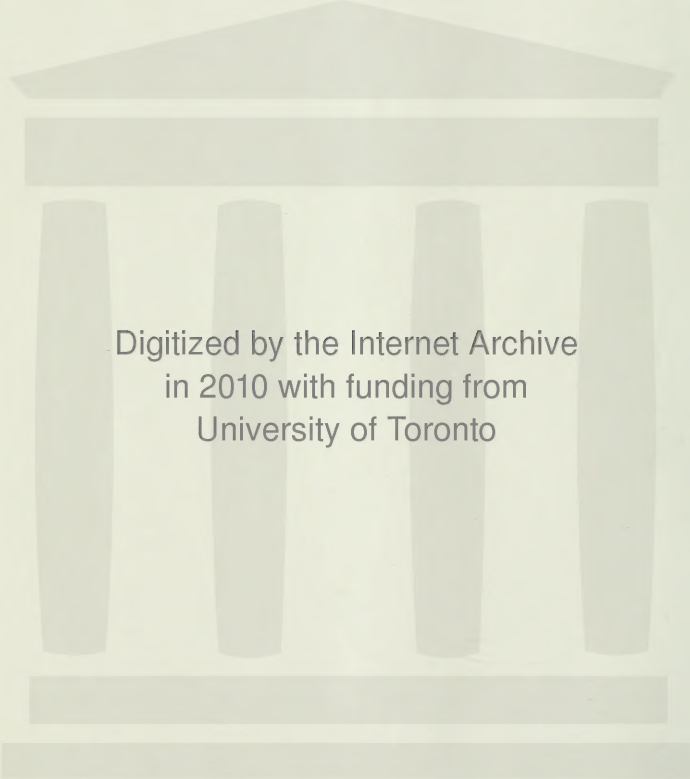
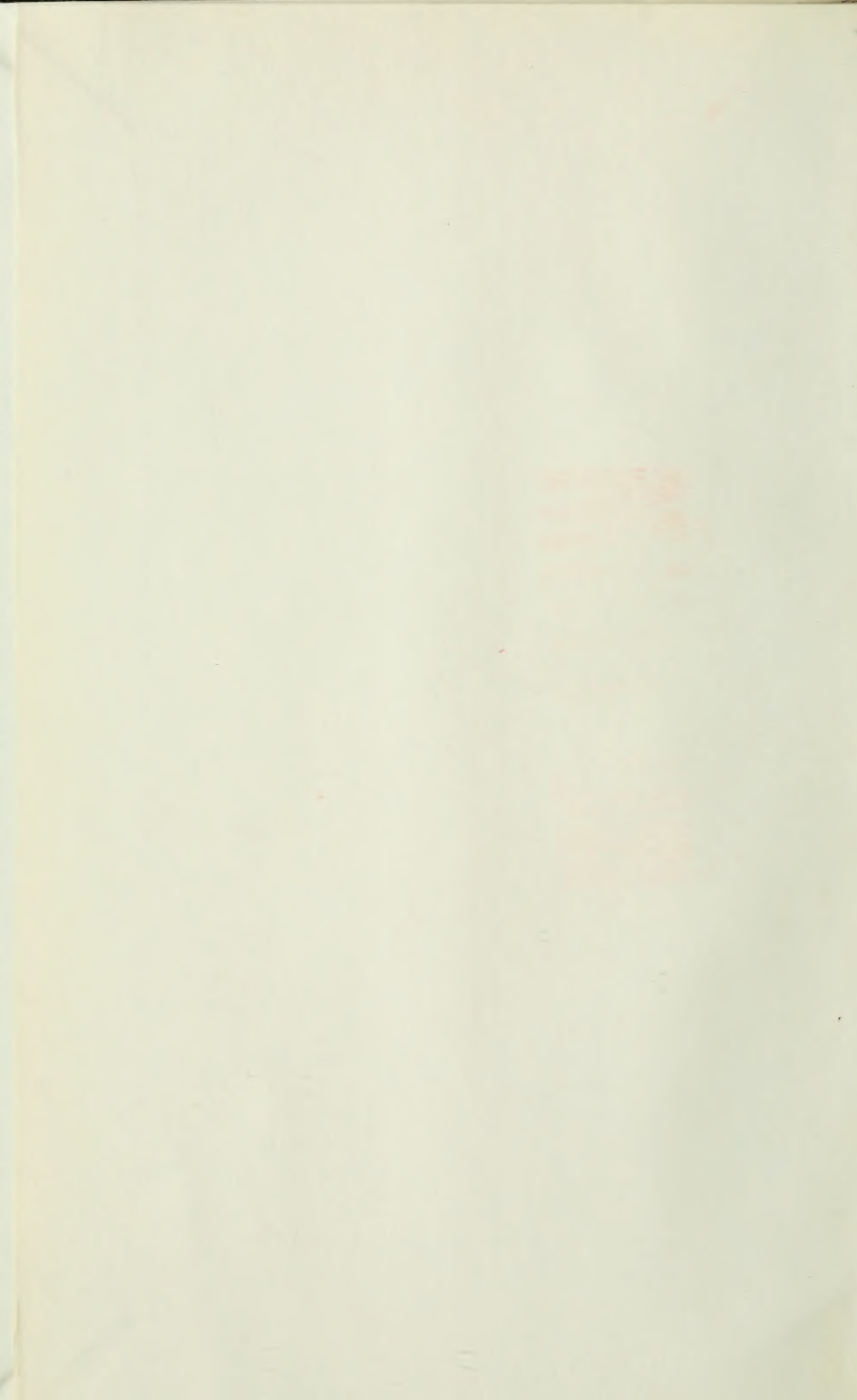




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1889

VOL. III

1890

THE
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BEING VOL. V OF THE

TRANSACTIONS

OF THE

OTTAWA FIELD-NATURALISTS' CLUB.

(Organized March, 1879: Incorporated March, 1884.)

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1889.

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EDITORIAL.

The present number is the first Quarterly part of Vol. III of the OTTAWA NATURALIST.

After careful consideration the council has decided to publish the magazine, for this year at any rate, in quarterly parts of not less than 48 pages. The scope of the publication has also been widened so as to include papers by members of the club upon the General Natural History of Canada, without being restricted as heretofore to this locality only.

It is hoped in this way largely to augment the usefulness of the Club, and at the same time to draw to our ranks naturalists from all parts of the Dominion.

It has been arranged by the leaders in the different branches to take charge of the weekly sub-excursions in the following rotation: the first Saturday in the month will be under the direction of the leaders in Geology; the second, of the Botanical leaders; the third, of those in Ornithology and Entomology; and the fourth of Zoology and Conchology. The general Post Office will be as heretofore the rendezvous, and the start will be made every Saturday punctually at 2 p.m.

When the General Monthly Excursion is held upon a Saturday it will take the place of the weekly sub-excursion.

The first General Excursion of the Club will be held this Spring on the 17th May, to Kingsmere in the Chelsea Mountains, and will be duly announced by circular.

The members are earnestly urged to consult with the leaders, without delay, as to the best means of carrying on effective study and useful investigation during the coming season.

We feel it our duty to call the attention of our readers to the advertisements, as we consider it incumbent upon the members of the club to patronize those firms which so materially assist us in carrying on our work.

J. FLETCHER,
Editor.

GEOLOGICAL SURVEY NOTES.

The arrangements are now being made for the field work of the Geological and Natural History Survey during the coming summer. Most of the operations will be in continuation of work already begun or directed toward its completion in certain districts. The fields in which the various members of the staff will be, are we understand as follows :

In British Columbia, Dr. G. M. Dawson will be occupied in continuing and extending the work of previous years, with special reference to recent mining developments. He will be assisted by Mr. J. McEvoy. Mr. Bowman will, it is hoped, complete a preliminary examination of the coal-bearing rocks of the lower Fraser. Prof. Macoun and Mr. J. M. Macoun are already in the field in the Southern part of British Columbia, where they are vigorously prosecuting their botanical and zoological investigations. A letter to the Editor dated April 14, states that they had then secured all the flowering plants in blossom, and 27 skins of birds and small mammals, as well as many insects.

In Nova Scotia Mr. H. Fletcher, with Mr. Fairbault, will investigate Pictou and Colchester counties. Work will be continued in New Brunswick by Mr. McInnes and by Prof. Bailey. Mr. R. Chalmers will also extend his systematic mapping of the superficial deposits in this Province during the summer. Dr. R. W. Ells and Mr. Giroux are again to return to the Eastern Townships, in the Province of Quebec, while it is intended that Mr. F. D. Adams and Mr. Low will carry on work to the north of the St. Lawrence. The investigation of the phosphate region to the North of the Ottawa is to be continued by Mr. E. D. Ingall, assisted by Mr. J. White. Mr. A. S. Cochrane is to be engaged in Western Ontario in further checking and correcting the topography of certain sheets of the geological map. Dr. R. Bell, assisted by Mr. A. E. Barlow, will be occupied in the completion of that sheet of the Ontario map which comprises the Sudbury mining district, and Dr. Lawson will pursue his investigation of the older rocks between Thunder Bay and Rainy lake, with the assistance of Mr. Smith.

In Manitoba, Mr. J. B. Tyrrell, with Mr. Dowling, is to continue the examination of the county near Lake Manitoba. Mr. R. G. McCon-

nel has already left for the petroleum district of the lower Peace and Athabasca region, to the future importance of which so much attention has lately been drawn. Mr. T. C. Weston will continue to collect in the Cretaceous and Tertiary beds along the Red Deer River, N. W. T.

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THE SASKATCHEWAN INSTITUTE.

We learn with pleasure that a new Literary, Historical and Scientific Society has been started at Prince Albert, N.W.T., under the above caption, "for the purpose of pursuing such literary studies as may be deemed interesting and instructive; of prosecuting original researches, within the District of Saskatchewan, of a historical and scientific nature; of collecting and preserving the early history, mythology, and folklore of the local Indian tribes; and of cultivating and encouraging the study of the Natural History and resources of the country." As stated in their circular, the Natural History and resources of that section of the Territories are practically untouched, and offer a large field of work for the Institute. We wish the Institute every success, and trust that it may grow rapidly, and succeed in the important work it has undertaken.

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SHORT INSTRUCTIONS FOR COLLECTORS AWAY FROM HOME.

Frequently inquiries are received from members who are about to take a journey, as to the best way to collect specimens of insects and plants. The following short instructions have therefore been drawn up at the request of the Council:—

INSECTS—*Moths, Butterflies and Dragon-flies* may be killed in the ordinary "cyanide bottle" and then placed in three-cornered envelopes made by taking small squares of paper and folding them across, almost in the middle, so as to make a triangular form with one flap a little smaller than the other, when the insect is placed between the two flaps, the two edges of the larger one are folded over the lesser, and the specimen is then ready to have the date and locality written on it and to be packed away, where it will not be disturbed. After a day or two the

specimens become very brittle and easily broken. They should therefore be stored in small firm boxes. Cigar boxes are very convenient.

Grasshoppers and other *Orthoptera* may be killed in the cyanide bottle and each one rolled up lightly in soft paper and then stored away in the same manner.

Beetles and *Bugs*—All *Coleoptera* and *Hemiptera* may be either placed at once in alcohol or in bottles containing sawdust dampened with alcohol.

Bees, *Ants* and *Wasps* may be collected for examination in alcohol but when possible they should be killed in the cyanide bottle and pinned in a cork-lined box.

Flies must be killed and pinned at once.

Spiders may be collected in alcohol.

Cyanide Bottle—This may be made either by placing a small quantity of Cyanide of Potassium in the bottom of a bottle and pouring in sufficient wet Plaster-of-Paris to cover it; or a hole can be hollowed out in the cork and a piece of cyanide inserted. This can be kept in place either with a plug of cotton wool, or a piece of chamois leather or linen may be tied over the cork. For beetles a few very small pieces of cyanide dropped into a bottle half filled with dry sawdust will answer.

It must be remembered that the active principle of Cyanide of Potassium being Prussic Acid it is intensely poisonous—any left on hand after the bottles are made should be at once destroyed.

Plants—Botanical specimens are made by pressing plants between sheets of dry paper and changing the papers every 12 or 24 hours until the specimens are dry. When staying for any length of time at one place a convenient press may be made as follows: Put down a few sheets of paper and on the top of these arrange a specimen, then a few more sheets of paper and another plant, and so on until all are arranged. Upon the top of the pile so formed put a box in which stones or sand to about the weight of twenty pounds may be placed. When travelling two boards held together with straps will answer all purposes. The quicker plants are dried the better the specimens will be. The papers for drying plants should never be left unchanged for more than 24 hours.

J. FLETCHER.

A NEW MOUSE. (*Evotomys Dawsoni*.)
— — —

In the *American Naturalist* for July, 1888, is a description, (with a figure of the molar teeth), of a new species of Red-backed Mouse, by our corresponding member, Dr. C. Hart Merriam. It was collected by Dr. George M. Dawson on the Finlayson River (Lat. 61.31 N. ; long. 129.30 W. ; altitude 3,000 feet), and the description also appears in the report upon the exploration in the Yukon district, and adjacent part of British Columbia, referred to on another page. Dr. Merriam finishes his description as follows:—"I take great pleasure in bestowing upon this handsome mouse the specific name *Dawsoni*, as a slight recognition of the indefatigable zeal of its discoverer, the distinguished explorer and geologist, Dr. George M. Dawson, who has added so much to the fund of knowledge relating to North-western Canada.

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ANOTHER STATE ENTOMOLOGIST.
— — —

It is with much pleasure that we notice the appointment of our esteemed corresponding member, Mr. J. B. Smith, as State Entomologist of New Jersey. Mr. Smith has been for some time past Assistant Curator of the National Museum at Washington. He is now State Entomologist, and Professor of Entomology at Rutgers' College and Scientific School, New Brunswick, N.J. We feel sure that this announcement will be read with great satisfaction by our members, many of whom have frequently experienced Mr. Smith's courtesy and kindness in naming entomological specimens, and we offer Mr. Smith our hearty congratulations. It is quite evident that Mr. Smith does not mean to let the grass grow under his feet. We have already received two bulletins from him since his appointment, (i.) "Entomological Suggestions and Enquiries," (ii.) "Memoranda about Cranberry Insects."

THE ANNUAL MEETING—1889.

The eleventh annual meeting of the Club was held on the 19th March, 1889, at 4.30 p.m. Present: The President, Mr. R. B. Whyte, in the chair; Messrs. Ami, Ballantyne, A. E. Barlow, Lt.-Col. Anderson, J. Fletcher, Hugh Fletcher, Prof. Macoun, Dr. R. W. Ells, W. H. Harrington, Dr. H. B. Small, T. J. MacLaughlin, Rev. G. W. Taylor, Dr. Thorburn, W. P. Lett, J. B. Tyrrell, W. A. D. Lees, F. T. Shutt, A. Bowman, N. Ballantyne, J. M. Macoun, A. P. Low, W. McInnes, J. McEvoy, W. R. Wright, A. C. Lawson, R. G. McConnell, E. R. Faribault, and some others.

The minutes of the last annual meeting were read, and confirmed.

The Secretary read the annual report of the Council.

There was a discussion as to the advisability of publishing the OTTAWA NATURALIST as a quarterly, instead of a monthly magazine. It was agreed to leave this to the decision of the incoming Council.

It was moved by Dr. Ells, seconded by Prof. Macoun, and carried, "That the scope of the publication of the Ottawa Field Naturalists' Club be extended so as to include papers, &c., on Geology and Natural History by members of the Club, from any portion of the Dominion of Canada (which may be read before the Society) instead of being confined to papers on purely local topics, as now understood by members of the Club."

The Treasurer read his annual statement, in which it was shown that a balance of \$30.69 remained in his hands after paying all demands.

The Librarian submitted a list of the additions to the library, which showed that many choice and valuable works had been received in exchange for the Transactions.

The election of officers was then proceeded with, and resulted as follows:

President—Dr. R. W. Ells.

1st Vice-President—Mr. J. Ballantyne.

2nd Vice President—Mr. H. M. Ami.

Secretary—Mr. T. J. MacLaughlin.

Treasurer—Mr. James Fletcher.

Librarian—Mr. W. A. D. Lees.

Council—Rev. G. W. Taylor, Mr. R. B. Whyte, Mr. A. P. Low.

Auditors—Lt.-Col. W. P. Anderson, and Mr. W. R. Billings.

ANNUAL REPORT OF THE COUNCIL.

To the Members of the Ottawa Field-Naturalists' Club :

It again becomes the pleasing duty of the Council to report that the Club is in a very satisfactory condition, and that the success achieved during the tenth year of its existence has not been less marked than that noted in any of the previous annual reports.

Notwithstanding that the membership has not greatly increased—the number of new members being only 27—its strength and development in other directions have been gradual and satisfactory.

The number of corresponding members remains the same as last year, no change having been made.

His Excellency the Governor General, Lord Stanley of Preston, has graciously consented to become the patron of the Club in the place of the Marquis of Lansdowne.

The general excursions held during the summer were four in number, and the following places were visited: The first was to Kirk's Ferry on the Gatineau River. This was the most numerously attended excursion yet held under the auspices of the Club, there being present no less than 135 members and their friends. The second was to Aylmer; the third to Eastman's Springs, and the fourth to King's Mountain.

Saturday afternoon sub-excursions were held throughout the season as usual, except during the month of August, beginning the first Saturday in May, the attendance showing that the interest taken in them in former years had not abated.

By means of these sub-excursions the geology and natural history of the immediate surroundings are being well worked up, still the work may be said to have only begun, and the leaders could not adopt a more successful plan of carrying it out, than by continuing these afternoon working parties.

The winter course of meetings comprised six soirees, and nine afternoon lectures. At the soirees the following papers and reports were read: Dec. 13th, the President's Inaugural Address, by Mr. R. B. Whyte; Jan. 17th, "Contribution to the Geology and Palæontology of the Townships of Russell and Cambridge, in Russell, Ont.," (I, Physiography and general Geology, by Mr. W. Craig, Duncanville; II, Palæon-

tology by Mr. H. M. Ami); "Revision of the Post-tertiary Formations about Ottawa with their Fossils," by Mr. H. M. Ami; note on *Onoclea sensibilis* var. *obtusilobata*, by H. M. Ami. Jan. 13th, "Report of the Botanical Branch," "Notes on the Duration of the Leaves of some of the Coniferæ," by Mr. J. Ballantyne; "Notes on Bog Plants," by Mr. R. B. Whyte; "Poisonous Properties of the *Agaricus Rodmani*," by Prof. Macoun; "An account of the first Lectures delivered in America on Botany at Harvard University," by Dr. H. B. Small; February 14th, "Report of the Entomological Branch," "Notes on the Ceraunbycidae," by Mr. W. H. Harrington; February 28th, "Notes on Ornithology, with special reference to birds observed in the vicinity of Renfrew," by Rev. C. J. Young; "Bird Calls," by Mr. J. M. Macoun; "What you see when out without your gun," by Mr. W. A. D. Lees; "Report of the Conchological Branch;" March 14, "Notes on the Skunk" (*Mephitis mephitis*) by Mr. W. P. Lett; "Report of the Geological Branch."

The Monday afternoon Elementary Lectures or classes were given as follows: Two on Conchology—one by Mr. F. R. Latchford, and one by Rev. G. W. Taylor; two on Geology—one by Dr. R. W. Ells, and one by Mr. H. M. Ami; two on Entomology—one by Mr. J. Fletcher, the other by Mr. W. H. Harrington; two on Botany—one by Mr. James Fletcher, and one by Mr. R. B. Whyte; one on Zoology, by Rev. G. W. Taylor.

The lectures were commenced on the 7th January, and continued every Monday afternoon to the 11th March, and the attendance at them, as well as at the soirees, was very encouraging. One of the most gratifying features in connection with the past year's work—and one which affords a good illustration of the influence which the Club continues to exert amongst its members—is that of the nineteen papers and lectures above mentioned, no less than eight were given by members who had not, until this winter, appeared before the Club in that capacity.

From the Treasurer's report you will learn that, financially, the standing of the Club is perhaps better than at any previous time of balancing. Mr. Fletcher has succeeded in collecting most of the accounts due for advertisements, and the subscriptions from many members who were far in arrears. The percentage of outstanding subscriptions is at present smaller than it has been for years.

The Exchange list has undergone a complete revision, and the NATURALIST is now sent only to those societies and individuals who show their appreciation of it in a practical manner.

The Librarian's report will be submitted to you, from which it will be seen that the names of most of the leading scientific societies throughout the country are on the list, and exchange their publications for ours, and that, between exchanges and donations, the library is becoming large and valuable.

During the past year, owing to difficulties and delays, over which the Council had no control, the issue of the NATURALIST was somewhat irregular, but the last number is now out, and the work up to date.

Experience has shown that there are many serious difficulties in connection with the monthly publication of the Transactions. The amount of labor involved in the editing, and in obtaining the necessary matter at the proper time, in order to bring the journal out punctually, is so great, that it is almost impossible to find any one who is able to devote to it the time necessary to do the work.

The Council, therefore, having had under consideration these, and the many other disadvantages which attend the present plan of publication, are of opinion that the quarterly issue in the future would prove more advantageous. It is believed that the journal could be brought out punctually on the first of every third month, with much less work for the editor and publishing committee, and that the difficulty now experienced in obtaining matter in time for the printers would be, to a great extent, obviated, and that the result would be altogether more satisfactory to the members generally. They would, therefore, recommend that, in future, the NATURALIST be published quarterly. They would also suggest that it is now in order to consider the advisability of authorizing the Council to publish in the NATURALIST (at their discretion) such papers, etc., from members of the Club on original work in geology and natural history outside of the present range of the Club's operations, as may be read before it.

All of which is respectfully submitted.

Signed on behalf of the Council.

T. J. MACLAUGHLIN,

Secretary.

19th March, 1889.

TREASURER'S REPORT.

To the Council of the Ottawa Field-Naturalists' Club.

GENTLEMEN,—I have the honour to report that the finances of the club are in a satisfactory condition. Notwithstanding heavy and exceptional expenditures during the past year we still have a balance on hand of \$30.69, after clearing up all indebtedness. During the year many subscriptions which had fallen in arrear have been collected. A few members from various causes have left the club, but their place has been filled by new members. Our heaviest expenditure is the publication of the Transactions of the Club in the shape of the "Ottawa Naturalist." This during the year just ended cost \$220.95. Besides this a further sum of \$40.56 was expended in reprinting entirely the first thirteen pages of the Flora Ottawaensis, and in having 100 extra copies struck off of pages 14 to 45. This makes a total of \$261.51 expended upon transactions, against which there was received \$67 for advertisements and \$33.75 for transactions sold; in all \$100.95. A new item in the accounts is \$11.00 as rent for the room in which we hold our meetings. The balance sheet is submitted herewith.

TREASURER'S BALANCE SHEET—1889.

RECEIPTS.	EXPENDITURE.
1888. Mar. 20—Balance \$20 16 1889. Mar. 19—Subscriptions, 1888-9\$152 00 Arrears 21 00 173 00 Transactions sold.... 33 75 Advertisements 67 00 Excursion receipts ... 107 30 \$401 21	1889. Mar. 20— <i>The Ottawa Naturalist</i> , Vol. II, Nos. 1-12...\$210 40 Postage 10 95 \$220 95 Extras of "Flora Ottawaensis" and re- printing first 13 pages 40 50 General postage 5 07 Stationery..... 1 05 Printing (circulars, postage, etc.) 10 99 Rent of Lecture Room 11 00 Excursion expendi- tures 80 90 Balance on hand 30 69 \$401 21

JAMES FLETCHER,

Treasurer,

Ottawa, March 19, 1889.

LIBRARIAN'S REPORT.

The following publications have been received during the year 1888-89, in exchange for the *Ottawa Naturalist*, or as donations: Some of them are exceedingly valuable additions to the Library of the Club.
Geological and Natural History Survey of Canada: Annual Report, 1886.

Catalogue of Canadian Plants—Macoun.—Parts III and IV.

United States Geological Survey: Monograph XII, Geology and Mineral Resources of Leadville, with Atlas.

Mineral Resources of the United States, Day—1886.

Mineral Resources of the United States, 1887.

Bulletins Nos. 40-47.

United States Department of Agriculture: Insect Life, Vol. I.

Bulletin No. 6, Botanical Division.

Report No. 50 of Statistician.

American Association for the Advancement of Science: Proceedings, Vol. XXXVI, 1887.

Cincinnati Natural History Society: Journal, Vol. XI.

Essex Field Club: Essex Naturalist, Vol. II.

Kellerman, Dr. W. A.: Journal of Mycology, Vol. IV.

Torrey Botanical Club: Bulletin, Vols. XV, XVI, 1-3.

The Editors: Botanical Gazette, Vol. XIII.

“ *Journal of Comparative Medicine and Surgery, Vol. IX, 3, 4, X, 1.*

Entomological Society of Ontario: Canadian Entomologist, Vol. XX, XXI, 1-3; and Annual Report, No. XVIII, 1887.

New York Microscopical Society: Journal, Vols. IV, V, 1.

American Ornithologists' Union: The Auk, Vols. V, VI, 1. Check List of North American Birds.

Montreal Natural History Society. Canadian Record of Science, Vol. III, 2-3.

Brooklyn Entomological Society: Entomologica Americana, Vols. IV, V, 1-2.

Webster, Frank B.: Ornithologist and Oologist, Vols. XIII, XIV, 1-2.

Cambridge Entomological Club: Psyche, Vol. V, 141-155.

Nova Scotia Institute of Natural Sciences: Proceedings and Transactions, Vol. VII. 1-2.

Laval University: Annuaire, 1888-89.

Queen's College: Calendar, 1888-89.

Elisha Mitchell Scientific Society: Journal, Vols, IV, V, 1.

Illinois State Laboratory of Natural History: Bulletin, Vols. II, III, 1-4.

Massachusetts Horticultural Society: Transactions, 1887-8, Part I.

Middlesex Institute: Flora of Middlesex County, Mass.

New York Academy of Sciences: Transactions, Vol. VII.

Smith, John B. Monograph of Shpingidae of America North of Mexico.
Notes on Callimorpha.

The species of Eueurythra.

American Museum of Natural History: Annual Report, 1887-88.

Johns Hopkins' University: Circulars, Nos. 66-69.

Farlow, Prof. W. G.: Memoir of Edward Tuckerman.

A Provisional Host Index of the Fungi of the United States,
Part I—Polypetalæ.

Supplemental list of works on North American Fungi.

Burgess, Dr. T. J. W.: How to Study Botany.

Manitoba Historical and Scientific Society: Annual Report, 1887.

Winnipeg Board of Trade: Ninth Annual Report, 1888.

Dolley, Dr. Chas. S.: Preliminary Abstract Report of Marine Laboratory stationed in 1887 at Nassau, New Providence.

Ami, Henri M.: Flora Temiscouatensis.

Königsberg—Physikalisch—Oekonomischen Gessellschaft: Schriften, 1887.

Honeyman, Rev. D.: Glacial Geology of Nova Scotia.

Lintner, Prof. J. A.: Fourth Report on the Injurious and other Insects of the State of New York.

Blytt, Prof. A. (Norway): On Variations of Climates in the Course of Time.

The Probable Cause of the Displacement of Beach Lines (two papers).

Meteorological Service of Canada: Monthly Weather Review, Mar.-Nov. Report, 1885.

Department of Agriculture, Canada: Report, 1888.

Statistical Abstract and Record, 1886.

North Staffordshire Naturalists' Field Club: Report of Transactions,
1887-1888.

Ragonot, Prof. E. L.: Diagnoses of North American Phycitidæ and
Galleridæ.

Boston Society of Natural History: Transactions, Vol. XXIII, 3-4.

Chamberlain, Montague: Systematic Table of Canadian Birds

W. H. HARRINGTON,

OTTAWA, 15th March, 1889.

Librarian.

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THE AMERICAN SKUNK.

By WILLIAM PITTMAN LETT.

Comparatively speaking, the call of the president for my unexpected appearance before you this evening, was as sudden and as rapid as the flight of the blue-winged teal coming down the wind at the rate of ninety-five miles an hour. However, like an ardent votary of the double hammerless choke-bore, I have endeavored to exemplify the sportsman's motto—*nunquam non paratus*.

I am almost a stranger upon this platform, partly through my own neglect and in some measure on account of my not having sufficient leisure to devote to the valuable and important objects of the Field Naturalists' Club, which I have always considered one of the most useful and interesting public organizations in the city of Ottawa.

I have selected for a few minutes' consideration this evening an animal of great beauty, although of a malodorous character, the habits and peculiarities of which are perhaps as little known, generally speaking, as are those of any animal indigenous to this part of Canada. Having said so much, my hearers can readily conclude that I am going to deal with the skunk, a task much more pleasant to perform theoretically than practically.

The Skunk (*Mephitis mephitis*), is an animal about the size of a large cat, perhaps a little bulkier in body, but not quite so long. Its general colour is brownish black, with white longitudinal stripes on each side of the back, as well as on the head. It has a long bushy tail, white upon the upper and black upon the under surface. The head

is short, the nose somewhat projecting, and the snout is rather blunt. The feet have five toes on each, those upon the fore feet being armed with strong, curved claws indicating the powers of the animal in burrowing. The coarser hairs on the skin are unusually long, beneath which the body is covered with a thick undergrowth of fine, soft glossy fur of great beauty.

The Skunk belongs to the *Mustelidae*, and like the bear, the marten and the otter, ranks among the digitigrades. It is a very slow moving animal. Unless near its hole, when disturbed, it never attempts to make a hurried retreat, but rather stands upon its dignity, with its feet on the ground and its tail to the foe. I may say that the dignity of the Skunk is very generally respected by those who have had any previous acquaintance with its proclivities.

The anal glands of the Skunk secrete a yellow coloured transparent fluid, which is intolerably fetid and offensive; notwithstanding which, I have learned that recently a deodorizing method is being tested in France, by means of which it is hoped that the lasting qualities may be preserved, and the noxious character of the odour so greatly mitigated as to serve like Musk or Civet as the foundation for perfumes of a most agreeable and pleasant nature.

When irritated, the Skunk is capable of ejecting this fluid to a distance of six or eight feet, in the form of a fine yellow spray, which spreads and widens in volume after it leaves its source. Such is the diffusive and penetrating potency of this volatile agent that I have known it to be carried by a brisk wind upwards of four hundred feet from the spot where it was discharged, into a field where a herd of cattle was grazing, causing the startled animals to run bellowing in a frenzied state in all directions. The animal which caused this excitement was fast in a steel trap, which I had set some days before for foxes. At the time of the incident, I had never seen a skunk; although I had had previous personal experience that the Township of Huntly, in the neighborhood of the present Carp Village, had been by no means neglected or forgotten in the topographical distribution of this beautiful little animal. I closely examined the stranger, and became suspicious; and in order to solve my doubts, I cut down a pole about fifteen feet long and stirred up the unknown. I assure you I was not long left in

suspense or doubt as to its identity. It is enough to say that my caution saved me the trouble and necessity of burying my clothes. I carried the trap home and placed it in a running stream. I left it there for six months, and when I took it out at the end of that period, "the scent of *mephitica* hung round it still."

While speaking of this peculiar feature of the Skunk, it may interest, if it does not positively benefit some one, if I reveal, without charging anything for the prescription, a secret connected with the mephitic weapon of the Skunk. While out one day in September, 1878, shooting ducks and prairie chickens on the prairies of the State of Iowa, a Skunk was killed by one of the party. The incident brought on a talk about the animal in the evening; when I was assured by a number of the citizens of the town of Algona that the offensive liquid secreted in the anal sacs was one of the best and most effective remedies for that obstinate disease, asthma. The remedy is applied by means of inhalation, and, in that state, is universally considered a specific of great value. The effect of its application is similar to that produced by the pungent odour of coal gas upon the symptoms of the whooping cough. There may be strong grounds for believing that the exterminating perfume of the Skunk may be of great benefit as a powerful remedial agent in the mitigation, and perhaps cure of asthma. During the summer months the remedy can be easily obtained; and it is well worth while to give it a trial.

I have given this hint, not merely as a naturalist, but, I trust, as a public benefactor. I believe that in the vast, and as yet but partially explored and undeveloped laboratory of nature, a remedy will yet be found for every ailment incident to the human constitution; more simple, and perhaps more effective, than the mysterious and elaborate formulas of the pharmacopœia or *materia medica*. I mean no offence to the learned and skilful professors of modern medical science, for whom I have the highest respect; nor have I any desire to be made the victim of the, at present, sheathed lancets of the disciples of Galen and Hippocrates.

The fur of the skunk is a valuable article of commerce, the pelt being enduring, the coat beautiful and glossy. The better class of skunk skins made up in Canada are produced by the States of New

York and New Jersey ; but why they should be superior to our own, while we have as good if not better climatic advantages, it is difficult to say.

The skunk is carnivorous, it might almost be said omnivorous. It feeds upon small birds, wild birds' eggs, frogs, mice, lizards, and insects, and is especially fond of grasshoppers, which it destroys in great numbers. It is a nocturnal animal, and it is charged with committing serious depredations amongst poultry.

The skunk is extremely cleanly in its habits, never allowing the smallest drop of the fœtid matter to defile its own fur. When suddenly killed no disagreeable odour is perceptible about the dead body ; and it is said that the flesh, when the animal is carefully skinned and properly cooked, is esteemed a great luxury by those who have tried it.

The den of the skunk is found more frequently upon flat ground than upon the sloping sides of hills. The holes extend from six to eight feet horizontally, then widen out into a cavity of considerable extent, the floor of which is covered with dry leaves and soft moss. The skunk being gregarious, in this habitation, in winter, may be found as many as fifteen or twenty of the animals. They retire to their dens in the early part of Autumn; and like the bear and raccoon, go through the process of hibernation, sustaining a semi-torpid existence upon the superabundance of fat accumulated during the summer. In the southern states they remain at large during the entire year, the climate being sufficiently warm in winter to suit their organization.

My old friend, that accomplished naturalist and distinguished paleontologist, the late Elkanah Billings, in relation to this animal says:

"In Dr. Lichtenstein's celebrated work, published in 1838, in Berlin, it is stated that there are seventeen species of the genus *Mephitis*; one of which is found at the Cape of Good Hope, two in North America and the remainder in Mexico and South America."

Mr. Billings further says: "This species of skunk—*i. e.* the skunk of the Ottawa Valley—is found all over the British American possessions, as high as 57° North, and ranges south to Kentucky, Carolina, and Alabama. It is common in Upper and Lower Canada. In the month

of April, 1856, we found a skunk in the Rideau canal, which apparently had been drowned in attempting to swim across; and a few days later another was shot by Mr. Lett, of Ottawa. We have the skulls of both." I have been told that the "Thousand Islands" in the River St. Lawrence, is an actual paradise for skunks.

Not being possessed of the agility of the fox, the weasel, the mink or the martin, the Skunk is not capable of doing much damage to game birds. It, however, reduces the number of those birds materially by the destruction of their eggs, which constitute one of its staple articles of food. But for this natural propensity, his comparatively trifling sin, robbing henroosts, is scarcely an indictment of sufficient gravity to warrant capital punishment, much less wanton and inhuman extermination. Humanity in the treatment of animals is closely allied to charity towards our fellow man. To use the beautiful and expressive language of the poet Cowper :

"I would not enter on my list of friends,
(Though graced with polished manners and fine sense,
Yet wanting sensibility) the man
Who needlessly sets foot upon a worm.
An inadvertent step may crush the snail
That crawls at evening in the public path;
But he that has humanity, forewarned.
Will tread aside, and let the reptile live."

Although one of the weakest and most insignificant of animals, the Skunk has been armed by nature with a means of defence as irresistible as it is often unexpected by an enemy attacking him with nature's weapons only. His appearance is innocent; his aspect is interesting and elegant, so much so that the stranger who is unacquainted with his nature and his habits is surprised by the realities surrounding a first antagonistic introduction to this gentle-looking child of the forest.

It has long been known that the oil from the fat of the Skunk is a valuable remedy for rheumatism, and upon consulting scientific authorities I have found that the fetid matter of this animal has long been

regarded as a remedy of singular effectiveness for asthma, as already stated.

The breeding and rearing of skunks, for their skins, has recently engaged the attention of enterprising speculators in the United States ; who would make far more out of the other, far more useful and important, parts of the animal than they could from the fur, if they were thoroughly acquainted with its history and its qualities.

The lion, the tiger, the leopard, the hyena, the jaguar, the crocodile, the boa-constrictors and the anacondas, possess, respectively, mighty powers of offence and aggression. I venture, nevertheless, to say, that a skunk, single-handed, could put any one of those ferocious monsters to flight.

How wonderful and mysterious are the provisions of nature, which thus invests small and weak animals with defensive attributes sufficiently powerful to resist the attacks of the strongest, and protect them from aggression and the danger of extinction. Even the "fretful porcupine," with its bristling array of dangerous spines, would be obliged to flee in terror from the resistless armament of the skunk.

Every living thing has its peculiar province and its wisely assigned sphere of usefulness in the great economy of Nature ; and as I have briefly endeavoured to prove, even the skunk—whose name is erroneously the popular synonyme of useless repulsiveness—is neither an uninteresting nor unimportant item in the grand and attractive volume of creation. Even the skunk is deserving of a commemorative and descriptive page in the beautiful and improving classics of Natural History—the investigation of which science, I may be permitted to say to an audience like the one before me—is one of the most delightful and instructive studies which can engage the attention of the human mind.

THE BIRDS OF RENFREW COUNTY, ONT.

BY REV. C. J. YOUNG, M.A., (Renfrew.)

Having been a member of the O. F. N. Club for several years, and always taking considerable interest in the various pursuits and studies the society has done so much to popularize, yet never until this evening have I been able to be present at a meeting. I gather from the programme which was sent to me, that evenings have been set apart during the present winter for the discussion of various branches of natural history; and that on the present evening ornithology and conchology should be the subjects under discussion. I will take the subject of ornithology. To my mind there is no more delightful study than this. I have always taken an interest in birds and their doings, from the times when I used to admire the eggs strung on strings in the cottages of the village where I was brought up in England, emptied of their contents through immense holes at each end, and hung up regardless of size or species—to as recent a date as the beginning of the present month, when I watched two gray shrikes in pursuit of the common sparrow. To one fond of nature, and nature's surroundings, ornithology lends a hand in bringing him into the presence of some of nature's grandest handiwork, or leading him among the sublimest sylvan scenes. Not so many years ago I spent a holiday with a relative,—I was not in the ministry at that time—in hunting amid the recesses of Cairn Gorm in Invernesshire, for the nest of the snow-bunting "*Plectrophenax nivalis*." We had read somewhere that a few of these birds bred on or near the summit, and had determined to try to verify the statement. The weather was cold and the season backward, when we started for the scene of our search, though it was the beginning of June. It is scarcely necessary to add that the immediate object in view was not attained and we did not even see the birds we sought. But in another direction we gained more than we dreamed of when we started, thus exemplifying my former statement that ornithology lends a helping hand to a study of nature. We reached the summit of that well known mountain, and delighted in the view, which none except those who have been there or in similar scenes can realize; we found specimens of the often sought for "Cairn Gorm" stones and noted many plants. On our way down we encount-

ered a thunder shower, and were glad to find shelter under a huge boulder. We reached the wood at the foot known as "Rothiemurchus Forest," just as the daylight faded into gloom. We had ten miles to traverse, and losing our path for a while, were glad to pass the night in a barn. And we reached our stopping place in the morning, so weary and tired that for some days after we could hardly walk around. And the object of all this, which some might call wasted energy, was to try to learn something of the breeding habits of our familiar Canadian "Snow-Bird." But although on that occasion I learnt and saw other things than those I was in quest of, I did not fail to learn something of birds too, for we found the ptarmigan or white grouse, breeding at the very summit of the mountain. We watched the golden plover at a lesser altitude. At the foot we found that rare British bird, the greenshank, so similar except in size, to the solitary sandpiper "*Totanus solitarius*," of this country; and not only saw the bird, but identified a breeding locality. For though we did not find the nest or young, we found a portion of an egg shell, from which the young had very recently emerged. This bird has a curious habit of alighting on the tops of fir and other small trees after the manner of some of the herons. I must not omit to mention that on this occasion too we came across the very local, crested titmouse, as well as the common crossbill. But I have said sufficient of that particular occasion; a few years later in another part of the country a holiday ramble was more prolific from an ornithological point of view than that one. I came across what might be aptly termed "the last breeding haunt of the kite." Some of you perhaps know how familiar a bird this once was in Britain, with its sombre reddish plumage, its great stretch of wing, and its majestic soaring high in the air. But it is now all but extinct: if England were searched through I don't think a nest could be found; two or three pairs may remain in Scotland and Wales. On one occasion in the latter days of Summer I saw as many as eleven of these birds circling in the air at one time.

But you are more interested in ornithology in the abstract, or at any rate in Canadian ornithology. Now let me tell you, I think very little interest is taken in this branch of natural history here. I think, as far as my small experience goes, the girls and boys, and the grown

people who have spare time don't trouble themselves at all about the birds. Some of you may say this is a good thing, for by it, you may think, many a bird with its nest and eggs is left unmolested. But this is not exactly the result of my experience. I hear of nests being torn down and the eggs trampled on, or the young destroyed. I hear of birds being shot at all seasons for no earthly purpose whatever. In short, I notice a great scarcity of birds in the part of Ontario where I live, and am told they are yearly diminishing. The prejudice, if I may call it such, to ornithology, and ornithologists is this:—People think it is a cruel study, or a useless one. Certainly a practical ornithologist must be prepared to endure the charge of cruelty. But think of the many, more especially in Britain, who love the subject for its surroundings, and who while taking part in it, scarcely ever sacrifice a feathered life. In days now passed, when I devoted a considerable amount of my spare time to this study, I may say I never destroyed a bird for the purpose of identification, and there are very few British land birds that I cannot identify. I have made myself familiar too, with many of the local Canadian birds, and all this without destruction of life. My method, and the methods of others like myself, is to provide a pair of strong field glasses; these assisted by a fondness for the pursuit, and a little reading, will generally accomplish the object, and make an amateur fairly proficient. I do not say I have never taken a bird's egg, perhaps I have taken too many, for in my time I have collected nearly 200 varieties of British eggs, and have added a few in Canada. Some lady may say: "How can you, who pretend to love the birds, boast of having destroyed in a sense the germ of life of so many; you whose function it is to protect rather than to destroy?" Yet to such a one I reply, that it is this very love which makes a naturalist and a collector sometimes cruel. To have reminders of former scenes, to look at some cherished specimen that in after years brings back to the mind's eye the sense of some former effort, some trial of strength, some anxious moment, the companionship of some dear friend, the thrill of excitement, the hardly earned trophy. There is no truer pleasure to a genuine lover of nature than that of watching the habits of birds in their free, wild state. I can scarcely say I approve of amateurs shooting the birds. I have been told by such that it is with feelings of

reluctance, and often of positive pain, that the fatal trigger is pressed, and thus is brought to a premature end a life full of joy and beauty. But yet for purposes of science or discussion a bird or an egg must sometimes be procured to be laid in the cabinet. It is occasionally impossible with the best glasses in the world for a naturalist to thoroughly know a bird, to learn the trifling points of difference which are often all that distinguish it from others of the same 'genus;' to understand its structure and other characteristics, unless he can handle and dissect it, as well as see it in the 'bush.' And again it is not to the one person alone, but to many, that the dead bird or the curiously marked egg brings the joy of the deeper knowledge of the Creator's love and wisdom. Look, for instance, at the collections in public places—at your own museum now forming here in Ottawa—to how many do and will the sight of these bring brief relaxation and recreation, among the many vicissitudes of every day life. Many a country lad and maiden will have their minds delighted by a visit to the collections, that individual effort, for the most part, is forming here. Therefore, do not set down every naturalist, every collector, as a cruel wretch, who takes life regardless of its value, but believe that many such feel from the heart the truth of the poet's words—

"He prayest best who lovest best
All things both great and small,
For the dear Lord that loveth us,
He made and loveth all."

And speaking of the elder among us, the collections we may look at, when advancing years forbid us any longer to follow nature in her haunts; the cases our eyes still eagerly scan will recall memories of some pleasant holiday, some glorious excursion in the days that are no more. It is a sight which breaks in upon the monotony of many a long hour of tedious work; this case recalls to a past lover of nature the white sands or the grassy marsh far away in the distant North; that case carries him back in thought to a long summer day spent on some wild sea shore; another one wakes up in him the thrilling excitement in some long and successful stalk. Yes! by these objects we live once more in the happy past, and the soothing influence thus procured lingers with us through many a solitary hour.

But you will say I am sermonizing, and you will grow weary of me before I have well entered on my subject, so let me continue more to the point and say something of our Canadian birds. My observations are very limited both as to time and the ground I have traversed. I can only tell you a little about some birds in Eastern Ontario. Let me begin with the eagle.

The Bald-headed Eagle, *Haliaeetus leucocephalus*, seems to be almost unknown now in the County of Renfrew. I have seen one in the course of three years, and that was a straggler. A few years ago I believe they were not uncommon. A pair still breeds, I am told, in the upper reaches of the Madawaska river, and just outside the County, at the headwaters of the same river, in the Nipissing district, they are still met with. I have seen one nest of these birds, a high mass of sticks in an elm tree close to the Rideau lake. This was nearly four years ago. On the 12th of May the nest was not completed, for whilst I watched, one of the old birds flew over my head with a piece of straw or reed in its beak, evidently intended as lining for that nest. Whether they still nest there I cannot say, but probably not. The golden eagle (*Aquila chrysaetos*) used also, I think, to nest in some of the rocks in the remote parts of Renfrew county. There is a very fine stuffed specimen of this bird in the village of Renfrew which was shot near the Petawawa river. The next birds I shall speak of are the hawks. In the southern part of the county of Lanark these are more plentiful than in Renfrew. In the latter county, although we might expect the contrary, they are quite rare. The fish hawk (*Pandion haliaetus carolinensis*) is occasionally seen, and nests in the locality. The nest is as a rule placed upon the top of a rampike standing in the water. I have noticed the goshawk (*Accipiter atricapillus*), the red-tail (*Buteo borealis*), the broad-winged *Buteo latissimus* Cooper's (*Accipiter Cooperi*)—of this I am not quite sure; the marsh hawk (*Circus Hudsonius*), the sparrow hawk (*Falco sparverius*). Of the first of these I found a nest in the county of Lanark, containing three eggs, on the 2nd of May, slightly incubated. A very fine specimen was shot the winter before last just outside of the village of Renfrew, and was given to me. I now have it stuffed and set up in a case. But the two commonest hawks are the broad-winged and the sparrow; the former in the bush,

the latter more frequently in the open fields. I have met with the nest of the broad-winged three times. On each occasion it was built against the trunk of a birch tree, at no very great height, for my eldest boy was able to climb up to it. The first nest contained eggs on the 9th May; the other two not until the 24th. Most persons who have taken an interest in the subject are familiar with the nesting habits of the little sparrow hawk. With regard to the marsh hawk, it appears early in the spring, hovering over some marsh, but it does not commence to lay its eggs until towards the end of May. I met with the nest twice in the county of Lanark, but am not sure whether it breeds in Renfrew; probably it does in suitable places. The first nest I found was simply a little grass scraped together in a marshy place, under a low bush. The second was quite a mass of sticks, &c., in a somewhat drier spot, and on the 6th of June contained three young ones and two eggs. Of the owls I cannot say much. The only one I have seen is the great horned owl (*Bubo Virginianus*). It is not common in the woods. I once came across a nest on a stunted tamarac in a large secluded marsh—a most unlikely spot for this bird to breed in—and I have now a living specimen which was reared from this nest nearly three years ago. Though this bird does not know what liberty is, it does not get tame, but constantly exhibits its wild, savage nature. Without going into detail, I may give short particulars of some other birds. The northern shrike is not uncommon in the winter. I have only seen one in the summer, and never saw a nest, to the best of my knowledge, though it or its near congener, the white rumped (*Lanius excubitorides*) is a not uncommon resident in the adjoining County of Lanark. I have seen its nest four times in thorn-bushes newly built in the month of April. The Canada jay is another resident. This bird is quite plentiful in the fall, but I have seen it in the spring two or three times in the Opeongo district. The blue jay is of course plentiful and breeds. Of the thrushes we have the brown thrush, or thrasher, the hermit thrush, the tawny thrush, and I suppose the olive-backed. The first three of these breed plentifully, the first named sometimes placing its nest on the ground beside a stone. Of allied species the water thrush, and the golden-crowned, or oven bird, are both

to be met with. That interesting group of birds, the warblers, is well represented. The common yellow warbler is very common some years, as last summer, when they were extraordinarily numerous. their nests being met with everywhere. In other years scarcely a nest is to be seen. In the County of Lanark I found the black and yellow warbler breeding as late as July, and have also seen the bird in Renfrew. I met with a specimen of the chestnut-sided last summer by the Mada-waska River, but this is the only time I have seen it. We have several others of this group, but they are hard to identify. The Arctic three-toed woodpecker has been unusually abundant during the past fall and winter. I saw eight or ten of them, but only one with the yellow stripe on the head. My first record is October 11th. Snow birds appeared very early last fall. I saw the first one on October 10th. The pine grosbeak has been common. I saw a number of small flocks, but have never seen any before in a period of five years in Lanark or Renfrew. There were also numbers of the American goldfinch or wild canary about in flocks during the winter, and the pine siskin has also been unusually numerous. My many engagements and other calls have not allowed me to give the time to this paper which I intended, and with regret I have to omit many items which I thought to bring in. However, I have, perhaps, well nigh succeeded in wearying you ; yet I trust the little information I have given may not be thrown away, but that all of you who take the same interest in the subject as I have done may, whenever the opportunity occurs, turn once again to the scene of former labors, and strive, for the benefit and encouragement of others who will afterwards follow in his footsteps, to unravel some of the still hidden mysteries of the bird creation.

WHAT YOU SEE WHEN YOU GO OUT WITHOUT YOUR GUN.

BY W. A. D. LEES,

Read February 28th, 1889.

When I was asked to read you a paper on the birds, I felt that I was very unfit for the task, never having had any more than a nodding acquaintance with the science of Ornithology, and having only begun a year ago to observe the birds with any degree of care. Still I could not make up my mind to lose the chance of telling you some of my first year's experiences so that you might be made aware how much wholesome enjoyment may be got from the study of birds, by any one who is willing to use his eyes and his ears, even though he be entirely without technical knowledge. And even here I feel that I shall fail, for no words of mine can adequately express the many and varied delights of a bird-hunt such as I was fortunate enough, almost weekly, last year, to share the enjoyment of with Mr. N. F. Ballantyne, a fellow-member of this Club, and such as I shall do my best to give you a brief outline sketch of. But before I begin, I should like to advise anyone who intends making a closer acquaintance with the birds, if possible to induce a friend to become his fellow-student. One will be enough, for the birds do not care to receive too many visitors at a time, but if this one be thoroughly in sympathy with you and with the birds, you will find that this arrangement will not only add a hundredfold to the charm of the work, (if such it may be called) but will be practically useful as well, for, apart from the pleasure of sharing newly acquired knowledge with one interested in the same subject, many cases of doubt arise in the identification of birds, where two heads are better than one. Even if you do get into a rather heated discussion, now and then, as to whether a given bird is a Bald Eagle or a Blackburnian Warbler, a Saw-whet Owl or a Wilson's Thrush, neither of you will be likely to carry away any very serious wounds from the fray, and each will determine to make sure of his bird next time.

But, say the orthodox ornithologists, "Why need there be any doubt of this kind? All you have to do is to shoot your bird, and carry it home, count its toes, and its primaries and secondaries (whatever they are), examine its beak and its other diagnostic marks, and you will then be able to say with confidence that it is either a woodpecker or something else." Well, I admit that all this is true, and for the systematic ornithologist it is the only way, but for one who merely wishes to know the birds in their native haunts, I submit in all humility it is not necessary, and when we went to work last Spring we decided not to do it. After long and sometimes warm discussions of the matter, we came to the conclusion that when we found ourselves in imminent danger of becoming great naturalists, there would still be time to shoot. Besides we had access to one of the finest public collections in Canada, supplemented by some very complete private ones, belonging to members of the club, which, we felt sure, the owners would be glad to let us see in case of need. Finally, what we most wished to study was the habits of the birds, and a dead bird has no habits in particular.

So we went out, armed with nothing more deadly than a double-barrelled field-glass, a note book, and a copy of McIlwraith's "Birds of Ontario," and, having mastered, to a certain extent, what a recent writer on "woodcraft" calls "the art of holding down a log," we made bags (I mean note-books) which were to us, at least, as satisfactory as if we had come home begrimed with powder, and reeking with the blood of slaughtered innocents.

From the bleak winter day when we first made out, against the dark background of spruce and cedar, the grey uniform with black facings worn by that arch-hypocrite the Northern Shrike, through all our varied experiences of musical thrushes and sparrows, nimble swifts and swallows, and gaily-clad orioles and warblers, till the climax of astonishment was reached when we got our first glimpse of the Scarlet Tanager in all his tropical brilliance, one new delight followed another, only leaving room for vain regrets that we had wasted so many years in ignorance of the wonders about us.

To give you some faint notion of what may be seen in a Spring day's walk, let me ask you to make with us, in imagination, what we

rather bombastically called "the grand tour," and for that purpose let us select, say, the 29th of April. Your imaginations will have to be early risers, for we are to start at 5 a.m., and even then the birds are ahead of us, for at ten minutes before that hour, while waiting for the start, a tiny Ruby-crowned Kinglet, hopping from branch to branch of a balsam fir, announces to the world at large, in one of the happiest little songs in nature, that he is taking his breakfast, and enjoying it too. A Black and White Warbler, creeping up the trunk of a cedar, is also up for the day, and catching, if not the early worm, at least something as toothsome to him. We go down the railway track, listening, by the way, to the White-throats at their matins, and, at the Rideau Bridge, we see first one, then a pair, of ducks, flying up the river. Instantly we level our glasses at them, but their speed is too great for such inexperienced shots, and "not identified" goes down in our notebooks. We make our way to Clarke's bush, which stands on the high ground to the South of the Rideau. Here, at the edge of the woods, we bring down our first Savanna Sparrow, a species which we find later in the summer to be tolerably common in the meadows and pastures, and here too we see, but alas! do not hear, our first Hermit Thrush. The woods are fairly ringing with the morning drum-taps of the Downy Woodpecker, the loud rattling call of the Flicker, and the incessant chatter and screech of Rusty, and Red-winged Blackbirds. As we proceed through the woods towards Billings' Bridge, we take time to look down as well as up, and find that the hepaticas and adderstongues have made the brown carpet of leaves beautiful, with their delicate blossoms, and that the buds of the wake-robins, and red trilliums are almost ready to open. In a piece of poplar swamp, we come upon the Myrtle Warblers, with their yellow crowns, and shoulder knots, hopping from branch to branch, catching the insects attracted by the blossoms of these trees. Then we come out into the open, and, in a wet pasture, we start up, (or should I say "flush?") a pair of Wilson's Snipe, at which we have several good shots with our glasses, as we follow them from one corner to another of the field, which they seem loth to quit, thus getting a very fair inventory of their markings. We come out at Billings' Bridge, and follow the road up the South side of the river, till we cross

the track of the St. L. & O. Branch of the C. P. R., between which and Hog's Back is a piece of mixed hardwood and evergreen bush, which, later in the season, we christened "Warbler's Paradise." It is a week too early for most of the warblers yet, and we see little but kinglets and nuthatches, creepers and chickadees, but within a month we saw, in this small resting-place of the Spring migrants, all or nearly all of the eighteen warblers we met with in our first year's investigations. Here I sat the whole of one afternoon in the beginning of May, and exclaimed to myself (for I was alone this time) as one after another, the Myrtle, Magnolia, Blackburnian, Black-throated Green, Yellow and Yellow Palm, Warblers, and the Redstarts, astonished me by the brightness and variety of their plumage and the sprightliness of their movements. Later still we found here such gems as the Black-throated Blue, the Chestnut-sided, the Bay-breasted, the Black-poll, and the Canadian. But to come back to April 29th, and resume our walk. Here it was that we saw a garter-snake and a copper-snake, (at least that is what we called them when we were boys), and here we note that the poplars, alders, and hazels shed pollen at the slightest touch. Here, too, we take the first swim of the season, at least one of us does, and it is a very short one, for the water is several degrees colder than the air, but evidently it is long enough to excite the wonder of the denizens of the deep, for while dressing after the bath, a muskrat pokes his nose up at the water's edge at the very feet of the bather, gives one look of astonishment at the demented human, who has thus early invaded his watery domain, then turns up his tail in evident disgust and "silently steals away." Later, as we lie resting among the pine bristles on the Hog's Back, we see a flock of ten ducks making all haste to reach some of the mountain lakes to the North of us, but this time they are out of range, and we turn homewards without having bagged any game bird but the snipe. Much worth telling occurred on the home journey, but I have already kept you long enough, and I should like to tell you before I finish of another kind of a tramp, and to show you that, though I have chosen a Spring walk to write about, almost as much enjoyment, though of a different kind, may be had from a tramp on snowshoes, in the depth of Winter.

To convince you that there is much to be seen in the woods in Winter, and that they are by no means deserted by the birds, it will be only necessary to mention that I have seen since the first of December, principally in Dow's Swamp (a perfect treasure-house for the naturalist at any time of year), sixteen different species of birds. Of these the first I think of, as he was the first I saw after beginning observations last February, is the Northern shrike, whom, earlier in this paper, I called an arch-hypocrite, and I did so advisedly, for at one moment you will hear him singing away on the topmost twig of some bare tree, proclaiming himself the most innocent and well-meaning of birds, and the next you will surprise him in the act of making a meal off some hapless goldfinch or siskin, which he has beforehand hung up in his butcher's shop in the thorn-bush. The White-winged Crossbill, when seen against a dark background of evergreens, as he hangs in every conceivable attitude, feeding on the seeds of the tamarac, is one of the handsomest birds of any season, and his cousin, the Red, or American Crossbill, is not far behind him in good looks. Then there is the big, solemn, Pine Grosbeak, who either does not know or is not afraid of man, whom all the other birds seem to consider, and perhaps not without reason, their natural enemy. In seasons when he comes from the North in any considerable numbers, as he has this winter, he may be seen wherever there are rowan berries, but if these are not to be had he will content himself with cedar instead. Occasionally we see, or more often hear, the White breasted Nut-hatch, who defies the cold with his cheerful nasal "quank," and we rarely miss the Chickadee, a veritable little Canuck, with his black cap and muffler, often accompanied by his brown-capped and chestnut-sided cousin from the North, the Hudsonian. The Hairy and the Downy Woodpeckers are to be seen, too, the latter a smaller edition of the former in the same binding. That handsome fellow in the cedars, who is talking to himself in an undertone, and now and then laughing at your efforts to spy him out in his dark retreat, is the Blue Jay. An occasional crow is also seen flying to and from his meals at the slaughter house, and once in a while we get a glimpse of the Ruffed Grouse or Partridge, while Redpolls, Goldfinches, Pine Siskins and Snowflakes complete the list. With all these to study, one can readily see that the

winter need be no more a time of idleness to the student of birds than the summer.

One thing more occurs to me to mention, and that is that the study of birds is as well suited to the gentler sex as to the sterner, and, being a firm advocate of co-education, I see no reason why each of us should not have for his companion in his "bird-walks" a sister, a cousin, or even a more distant relation.

And now that I have come to the end of my ramblings, I give you the parting advice "Try it for yourselves."

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REPORT OF THE GEOLOGICAL BRANCH.

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(READ MARCH 7TH, 1889.)

To the Council of the Ottawa Field Naturalists' Club:—

GENTLEMEN :

In presenting you with the annual summary report of the Geological branch of the Club's work, the leaders have much pleasure in announcing that the interest which has been manifest and increasing, from year to year, since the organization of the Club, a decade of years ago, bids fair to continue increasing, as the field of geological investigations is wide and far from being exhausted. Since early spring, (1888), and even before the sun's rays had caused the most recent formation of snow to disappear, work was begun, and collections were made by several members. Then came the excursions and sub-excursions, which were held at regular intervals during the Spring, Summer, and Autumn months. The excursions were very well attended, but the sub-excursions, with one or two conspicuous exceptions, were only fairly well attended. It is believed that more systematic work can be performed, and better results obtained, if small working parties are organized, and examine, carefully, definite areas.

Among interesting notes and specimens obtained, during the season of 1888 may be mentioned the following :

In the Post-Tertiary formations, Mr. Ami has continued taking observations, and making notes of sections, and of the fossil remains found in them. A detailed study of these formations, at the Central 'Experi-

mental Farm, was made, and interesting sections recorded. Special attention was given to ancient river channels, and many evidences were obtained respecting their course and extent. On both sides of the present Ottawa River, ancient river channels were discovered and noted.

Mr. C. B. Wright's brick yard was visited, by Mr. Ami in February, and he obtained the fine specimen of a young harp seal, which is now in the National Museum, Sussex street. It was embedded along with other species of marine organisms, in the "Leda clay" formation, at a depth of thirty-two feet. The specimen exhibits the lower left ramus, portion of skull, and most of the vertebrae, and costae, with the scapula and other bones of the limbs, and is nearly entire. Mr. T. C. Weston has cleverly articulated the specimen, and it may be seen in the museum.

In the Utica formation two important discoveries were made by Mr. Ami, viz., a new sponge, and a new barnacle. The sponge consists of slender and simple spicules, arranged in a cyathiform or radiating manner, and occurs in the upper portion of the lower half of the Utica formation. The first specimens collected were obtained from the Utica shales drawn to the paths of Major's Hill park, from a lot on the Montreal Road near the St. L. & O. R. R. crossing. The best collection however, was made from a trench on Albert street, between O'Connor and Bank streets, at the same horizon. The best specimens were sent to Dr. Geo. J. Hinde, whose researches in fossil sponges are so well and favourably known that the Ottawa material could not be placed in better hands. Dr. Hinde has very kindly undertaken to describe this species, which seems to belong to a new generic type.

The other new form of interest, found in the Utica, last summer, is a remarkable example of a *Turrilepas*, which was found associated with *Siphonotreta Scotica*, and other forms already recorded in the OTTAWA NATURALIST, in the lower Utica at the Rideau River beds, opposite the rifle range. These cirripedes are of rare occurrence in Canada, only one or two other species having been noted from New Brunswick, in Silurian and Cambro-Silurian, (Ordovician), strata. This Ottawa *Turrilepas* was forwarded to Dr. Woodward, F.R.S., etc., Keeper of the British Museum, who has made a special study of this interesting group of fossils, and a paper on it will shortly appear in the *Geological Magazine*, London.

Notes on the mode of occurrence of these two forms, and the species found associated with them, were sent, along with the specimens, to Dr. Woodward and Dr. Hinde for publication.

Other notes on fossils and general geology were also obtained during the past season, which will add considerably to the material already on hand for the construction of a detailed geological map of Ottawa. At excursions and sub-excursions of the Club one of the leaders, as usual, gave addresses on the geology of the district visited.

In conclusion the leaders hope that the interest manifested in the study of geology of Ottawa shall continue, as in the past.

Leaders: { HENRY M. AMI.
 { R. W. ELLS.

Ottawa, March 7th, 1889.

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REPORT OF THE ENTOMOLOGICAL BRANCH FOR THE YEAR 1888-89.

To the President and Council of the Ottawa Field Naturalists' Club :

GENTLEMEN,—Although only a few of the members have taken an active part in the work of this branch of the club, a considerable amount of useful study has been prosecuted. Early in the Spring, before the snow had left the ground, several sub-excursions were made by the leaders on snow shoes. In all instances were they well repaid for their trouble, and they would draw the attention of members to this pleasant mode of collecting at a season of the year when it is supposed that little or nothing can be done in the way of collecting insects out of doors. The hibernating larvæ or pupæ of several moths, and a few butterflies may be found by those who know where to look for them. Many beetles pass the winter in moss or beneath flakes of bark upon standing trees. Again in running water many aquatic species of beetles are to be found even in mid-winter. These may be collected by cutting a hole in the ice and then watching till they come to the surface. At the bottom amongst stones and leaves many aquatic larvæ occur. In addition to this many kinds of galls on plants may be collected in winter, perhaps to better advantage than at any other time of the year. The study of galls will be found to be most interesting. The novice will be surprised to find that several different kinds of

insects frequently emerge from the same gall. These are first of all the gall-maker. Then what are known as "guests" or "inquilines," which do not make the galls, but which live in and upon them after they are formed, and lastly there are various kinds of parasites which prey upon the gall-makers and their guests. Trees and plants which will always supply the collector with material for study are the oaks, the roses, the various willows, and several kinds of composite plants as *Solidago*, *Aster* and *Lactuca*. Besides the galls which may be found on the stems during the winter, there are many more which are formed on the leaves, which must be collected during the summer.

A good deal of work was done last season in breeding insects, both from the egg and from larvæ and pupæ collected in the field. This is without doubt one of the most useful and absorbing branches of Entomology. Successful remedies for injurious species can only be arrived at by carefully working out their life histories, so that the stage in which they may be most advantageously attacked may be discovered. In order that this information may be complete it is necessary to breed the insects from the egg to maturity. The eggs of many kinds are readily obtained and easily reared. The leaders are of the opinion that if some of our members, who have never given any attention to the study of insects would only collect a single species of the many beautiful butterflies which appear early in the Spring, confine it over its food-plant until it laid its eggs, and then watch the caterpillars through their different stages till they changed to chrysalids, and then again come forth as the perfect butterflies, that they would find so much pleasure in the observations that many more would join in the work of this branch. It will always give them much pleasure to advise or instruct anyone who applies to them, as to the best means of capturing, confining and treating the female insects and the young caterpillars after they hatch, but the operation may be briefly described as follows. Having caught a female insect of which the food-plant is known, confine it by means of a bag of gauze tied over a small plant, or if the food-plant be a tree by drawing the bag over a branch, so that the insect may have fresh living leaves to lay upon. The cage so formed should be so placed that the direct rays of the sun cannot fall upon it. Eggs will generally be laid in

about 48 hours. If they are not, the female should be taken out and fed with weak sugar and water. In looking for the eggs the bag the leaves and the stems must all be examined carefully, because although it is necessary to have the food-plant present the insects will frequently lay their eggs all over the netting or on the stems. When the eggs are laid they should be removed at short intervals and put away in a cool place, as there are many enemies which would destroy them.

Eggs hatch in a period varying in different species from 4 to 21 days. The young caterpillars should at once be placed either upon a living plant of their food or in a tight vessel with some fresh leaves. Tin-covered jelly glasses or small tin canisters are very convenient for this purpose. The young caterpillars should not be touched with the hands, but in changing their food the leaf upon which they are resting should be put back with the fresh leaves. When about to moult their skins they should not be disturbed.

Amongst rare insects which have been collected during the year, mention may be made of *Chinobas Jutta*, (female), from which eggs were obtained, and the young larvæ are now being reared.

Feniseca Tarquinius. Several specimens bred from clusters of Aaphides, (*Schizoneura tessellata*), which occur upon the alder.

Lycena Comyntas. One specimen taken at Aylmer.

Amongst injurious insects Cutworms and Locusts attracted most attention by the enormous numbers in which they occurred.

Several specimens of the larvæ of the Grape-vine Sphinx (*Philampelus Achemon*), were collected, and the large caterpillars of *Sphinx Chersis* were so numerous upon young Ash trees as in some places to almost strip them.

The local collections in all orders are being considerably increased every year, and Mr. Harrington hopes to have a list of the Hymenoptera ready for publication next month.

JAMES FLETCHER,
W. H. HARRINGTON, } *Leaders.*
T. J. MACLAUGHLIN, }

BOOK NOTICES.

REPORT OF THE EXPEDITION IN THE YUKON DISTRICT, N. W. T., AND
ADJACENT NORTHERN PORTION OF BRITISH COLUMBIA.—By Dr.
G. M. Dawson, 1887.

The above report which is upon a portion of the work of the Yukon Expedition of 1887-88, by Dr. G. M. Dawson, forming Part B. of the Annual Report of the Geological Survey, (1887) has just been distributed. In this report Dr. Dawson details the results of that part of the exploration carried out by himself, adding thereto some portions of Mr. McConnell's work during 1887, which belong to the same general region. Further reports, dealing particularly with the country to the North and East of that covered by this publication, are stated to be in course of preparation by Mr. R. G. McConnell and Mr. W. Ogilvie.

The present report is a book of 277 pages, and is accompanied by an index map, while a detailed map with Geological indications, in three sheets, including the Strikine, Dease, Upper Liard, Frances, Pelly, and Lewes Rivers, with adjacent country, is promised in the course of a few days, under separate cover.

A comparison of the index map, with previous maps professing to represent the same regions, coupled with Dr. Dawson's well known accuracy, shows what an important contribution this report is to our knowledge of the Geography of North Western Canada. The first part of the report is of a general character, and in this the ruling physical and geological features are described, and some facts given respecting the climate, flora, fauna, and resources of the country as a whole. In the following part the country examined is taken up by districts, and greater detail is entered into. Historical notes are also added for each district, of the exploits of the few earlier explorers, who originally penetrated this country in the interests of the Hudson Bay Company, or for other objects.

The report includes seven appendices, of which the first is on the distribution of trees, the second on the Indian tribes of the regions, the third a list, by Professor Macoun, of the plants collected (201 species, of which three are new.) The fourth appendix is zoological, including

a list by Mr. James Fletcher, of diurnal lepidoptera, a short list of fishes by Dr. T. H. Bean, and a description of a new mouse by Dr. C. H. Merriam (see page 11 of this number.) In the fifth appendix Mr. F. D. Adams describes the microscopical characters of some of the rocks collected; the sixth contains meteorological observations, and the seventh is a survey of the astronomical observations taken along the route of travel, upon which the positions of places, as given on the map, depend.

It is, naturally, impossible here to do more than mention some of the main headings of this valuable report, which, constituting as it does, the first authentic or systematic account of a vast region, of which very little has up to the present time been known, cannot fail to be of great interest to all. This region, even that portion of it which lies to the North of the 60th parallel, appears to be possessed of considerable natural resources, and is by no means the sub-Artic waste, which some theorists have assumed it to be in advance of its exploration.

J. F.

CONTRIBUTIONS TO CANADIAN PALEONTOLOGY.—PART 3—ON SOME FOSSILS FROM THE TRIASSIC ROCKS OF BRITISH COLUMBIA—By J. F. Whiteaves, F.G.S., F.R.S.C., &c.

Distributed advance copies of this contribution, published by the Geological and Natural History Survey of Canada, contain, besides a history of the discoveries of Triassic fossils in Canada, notes on and descriptions of nineteen species, of which the following are new to science:

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| 1. <i>Spiriferina borealis</i> . | 8. <i>Popanoceras</i> <i>McConnelli</i> . |
| 2. <i>Terebratula Liardensis</i> . | 9. <i>Acrochordiceras</i> ? <i>Carlottense</i> . |
| 3. <i>Monotis ovalis</i> . | 10. <i>Trachyceras Canadense</i> . |
| 4. <i>Halobia occidentalis</i> . | 11. <i>Arniotites Vancouverensis</i> . |
| 5. <i>Trigonodus</i> ? <i>productus</i> . | 12. " <i>sp. indt.</i> |
| 6. <i>Margarita Triassica</i> . | 13. " <i>or Celtites</i> . |
| 7. <i>Nautilus Liardensis</i> . | 14. <i>Badiotites Carlottensis</i> . |

The remaining *five* species have been "identified with previously described species." They are *Terebratula Humboldtensis*, *Monotis subcircularis*, *Halobia Lommelli*, *Arcestes Gabbi*, *Aulacoceras Carlottense*.

The specimens were for the most part collected by the director and officers of the Geological Survey during their explorations, and include the following collections: 1875, Dr. Selwyn, Peace River, lat. 56° 10', and long. 122° 10'; 1877, Mr. J. Hunter, Upper Pine River,

lat. $55^{\circ} 30'$, and long. 121° ; 1877, Dr. G. M. Dawson, Whipsaw Creek, Similkameen River, B.C. and "Nicola Series," Lake Nicola, B.C.; 1878 Dr. G. M. Dawson; Queen Charlotte Islands, several localities; 1887, Mr. R. G. McConnell, Liard River, lat. $59^{\circ} 16'$ and long. $125^{\circ} 35'$.

The publication is timely and valuable, and the plates which are to accompany the text, prepared by Mr. L. M. Lambe, are all ready, and will be issued shortly in conjunction with part 2 on "Fossils of the Hamilton Formation of Ontario," by the same author.

H. M. A.

ON ARCHÆOCYATHUS, BILLINGS, AND ON OTHER GENERA, ALLIED TO OR ASSOCIATED WITH IT, FROM THE CAMBRIAN STRATA OF NORTH AMERICA, SPAIN, SARDINIA AND SCOTLAND.—BY Dr. George Jennings Hinde, F.G.S., &c., &c.

Quarterly Journal of the Geological Society of London. Vol. XLV, Part I, No. 177. P. 125, *et seq.* This paper is the result of an exhaustive and critical study of the genus *Archæocyathus*, described by Mr. Billings in 1861 from the Potsdam limestone of L'Anse au Loup, Labrador, and giving its history as well as that of the allied genera *Ethmophyllum*, Meek, *Archæocyathellus*, Ford, *Protocyathus*, Ford, *Protopharetra*, Bornemann, *Coscinoocyathus*, B. and *Anthomorpha* B. Then follows an interesting chapter on the "Mineral nature of *Archæocyathus*, and its allies," after which their "mode of growth and structure" are fully described—the descriptions of Billings, Meek and Bornemann having been amended by the undoubtedly ablest authority on fossil sponges, so that their true nature and affinities are now revealed. The new genus *Spirocyathus* has also been created by Dr. Hinde, to receive Billings' *A. Atlanticus*.

Regarding the affinities of the *Archæocyathinae*, Dr. Hinde holds the view that they "belong to a special family of the *Zoantharia sclerodermata* (corals) with near relationship (leaving *Anthomorpha* out of account) to the "Perforata."

Dr. Hinde then describes two new Genera: *Archæocyathia* (which is proposed to include *Archæocyathus Minganensis*, Billings) and *Nipterella*, to include *Calathium ? paradoxicum*, Billings, followed by a dissertation on *Trichospongia*, Billings. *Archæocyathus* is thus considered to belong to the special family *Zoantharia sclerodermata*, *Archæocyathia*, is shown to be a lithistid sponge; *Nipterella*, n.g., the same, and the genera *Calathium* and *Trichospongia*, to be undoubted siliceous sponges.

A double page plate (Plate V.), of illustrations of the Cambrian *Archæocyathinae* and sponges accompany the text and shew the microscopic as well as macroscopic characters of the species represented.

H. M. A.

GEOLOGICAL SURVEY OF THE STATE OF NEW YORK—PALEONTOLOGY,
VOL. VII.—By Prof. James Hall, assisted by Mr. J. M. Clarke.

This handsome volume contains, figures and descriptions of the Crustacea belonging to the Upper Helderberg (Corniferous), Hamilton, Portage, Chemung and Catskill groups. Amongst the specimens described the following forms from Canada are noticed, ten of which are new to science and are referred to in the following list:—*Phacops cristata*, H. var., *pipa*, N. var.; *P. rana*, Green; *Dalmanites* (*Hausmannia*) *pleuroptyx*, Green; *D. (H.) concinnus*, H., *D. (H.) concinnus*, H. var. *serrula*, N. var., *D. (H.) phacoptyx*, N. sp.; *Dalmanites* (*Cryphaeus*) *comis*, N. sp.; *Dalmanites* (*Chasmops*) *anchiops*, Green; *Acidaspis cullicera*, N. sp.; *Lichas* (*Terataspis*) *grandis*, Hall, (*Lichas superbus*, Billings); *Lichas* (*Hoplolichas*) *hylaëus*, N. sp. *Proetus crassimarginatus*, Hall; *P. stenopyge*, N. sp.; *P. delphinulus*, N. sp.; *P. tumidus*, N. sp.; *P. Phocion*, Billings; *Phaethonides arenicolus*, N. sp. and *Cyphasps minuscula*, N. sp.

The above species are all from Western Ontario, Canada, except *Proetus Phocion*, which occurs in Gaspé, Quebec, Port Colborne, Cayuga and Walpole are the principal localities from which the above species were obtained.

There is in addition, Pt. II of Vol. V, Pal., N.Y., (supplement) on Pteropoda, Cephalopoda and Annelida from the Niagara, Lower and Upper Helderberg, Hamilton and Waverly groups of New York State.

H. M. A.

THE ROYAL SOCIETY OF CANADA.

The next annual meeting of the above society will be held in this city upon the 7th, 8th, 9th and 10th of May.

The different sections will meet in the Committee Rooms of the House of Commons, and the members of the Club have been specially invited to attend.

Our President, Dr. Ellis, will represent the Club, and if any members wish to submit papers they should at once communicate with him, so that the necessary arrangements may be made for their presentation before the proper section.

AUTHORS' EXTRAS.

It has been decided by the Council that authors of papers, which appear in the OTTAWA NATURALIST, may in future procure extras of their articles, by paying the actual cost of printing, and 25 cents for the Club funds. This will be \$1.25 for 100 copies of any article under 8 pages in length. Orders for extras must be sent in to the editor, at least one week before the issue of the quarterly parts.

NOTES ON THE GEOLOGICAL RELATIONS AND MODE OF OCCURRENCE OF SOME OF THE MORE IMPORTANT ECONOMIC MINERALS OF EASTERN QUEBEC.

R. W. ELLS, LL.D., F.G.S.A.

That part of the Province of Quebec situated to the south and east of the River St. Lawrence, in which is included the portion more particularly styled the Eastern Townships, may be briefly stated to have a length of about 470 miles from the boundary of the State of Vermont to the extremity of Gaspé, with a breadth of from 100 to 120 miles between Montreal and the boundaries of Maine and New Hampshire. This breadth, however, gradually decreases northward until a short distance below Quebec it becomes less than thirty miles. Beyond this it assumes greater proportions, and in the peninsula of Gaspé itself, which projects like a huge finger into the Gulf of St. Lawrence, the distance from shore to shore is not less than seventy to seventy-five miles.

Through the interior of this area, and in most cases not far from its central line, a belt of hilly country, with elevations reaching in places a height of 3,500 to 4,000 feet above the sea, extends, with a few interruptions, throughout the entire distance. These hills are known under various names, as the Sutton Mountain Range to the south-west, the Stoke Mountains near Sherbrooke, the Buckland Hills north of the Chaudière River, and the Notre-Dame Range which has a considerable extent in Gaspé and is there further distinguished by the title of the Shick-Shocks. To the south-west, in Vermont, the continuation of these hills is known as the Green Mountains, the extension of which, under different names, can be traced nearly to the Gulf of Mexico.

The fertility of much of the country throughout this portion of the Province is well known. Underlaid to a great extent by a broad area of slaty rocks, with which is associated a considerable development of limestone, their decay has produced a soil of great value to the husbandman; so that what is known as the "Eastern Townships" has long enjoyed a most enviable reputation both for farming and dairying operations, and here are found some of the most celebrated farms and stock centres of Canada. The eastern or Gaspé section has, on the other hand, remained comparatively unknown; the general impression being

that its surface and climatal conditions were unfavorable to the labors of the husbandman. While, to a certain extent, this may be true of certain portions, large areas exist there which, underlaid by the calcareous slates and limestones of the Silurian and Devonian systems, possess a soil almost precisely similar to that on which the most prosperous settlements of western New Brunswick are situated, as seen in the counties of Carleton and Victoria; while through the interior of the peninsula extends a broad area, having no great elevation above the sea, bounded on either hand by lofty ranges, and which, but for its present comparative inaccessibility, would doubtless have long since been brought into prominence as a desirable country for the farmer or the stock-raiser. In this broad valley, which extends from the Metapedia River to the Gaspé Basin, most of the larger streams of the peninsula take their rise. On the hill slopes great quantities of valuable timber, spruce, pine and cedar, are found, while the upper portions of the rivers flow through extensive hay swamps, and the conditions are such, apparently, as to greatly favor the successful development of this section so soon as easy means of access are provided. At the present time the population is confined entirely to a narrow strip on either shore, but more particularly to the south side or that bordering on the Bay des Chaleurs, where the value of the rich soils of the Lower Carboniferous formation has long been known.

More than forty years ago, Logan and Murray explored many of the streams of the Gaspé district and scaled the rugged peaks of the Shick-Shock range, not only for the purpose of studying their structure, but in order to effectively carry out a system of triangulation by which the prominent hill features of this almost inaccessible portion could be accurately mapped. Since then others have traversed the country in nearly every available direction, and have outlined its physical and geological structure with much care. It is, however, in that portion of the Province lying to the south and east of the St. Lawrence, between Quebec and the American boundary, that by far the greatest amount of detailed geological work has been done, and here, as everyone familiar with the history of Canadian geology knows, some of the most interesting and difficult problems peculiar to the science are presented, the complete working out of which has not yet been accomplished. Here the

complicated structure of the rock masses which compose the mountain ranges, and the faulted, crumpled and widely different character of much of the strata on either side have given rise to a great diversity of opinion regarding their true position in the geological scale. In Canada these problems have been discussed mostly under the head of the Quebec group, while in the adjoining States the fight has been carried on under the name of the Taconic controversy.

The earliest expressed views of Sir Wm. Logan, in 1847, assumed that the age of the mountain ridges of the Eastern Townships was probably that of the Hudson River division of the New York geologists. Although the rocks were for the most part in a highly crystalline condition, they were supposed to be the metamorphic equivalents of the comparatively unaltered and frequently highly fossiliferous sediments which occupied the greater part of the country between their slopes and the St. Lawrence. All traces of these fossils were held to be eliminated by the process of metamorphism to which the strata had been subjected, and by which, also, the shales and sandstones were converted into highly crystalline schists and chlorite rocks.

This view as to the metamorphism of the fossiliferous strata of the south side of the river was maintained by most workers in this field for nearly twenty-five years, although the opinion formerly expressed as to the Hudson River age had been modified in 1860 by Sir Wm. Logan, owing to the discovery of a great series of fossils in the rocks about Point Lévis and at other points which clearly indicated that their true position was at the bottom of the Cambro-Silurian system rather than at the top as had so long been supposed. As early, however, as 1862, Mr. Thomas Macfarlane compared the crystalline schists and associated rocks of the Eastern Townships with the upper part of the primitive schist formation of Norway, and also with the copper-bearing series of Lake Superior. The resemblance of the two series was also pointed out by Sir Wm. Logan, in the *Geology of Canada*, 1863. The Huronian aspect and probable age of these crystalline rocks was first recognized and publicly stated by Dr. Hunt, in 1871, and later, in 1877, by Dr. Selwyn, while in the late report on this portion of Quebec by the writer, 1886, these rocks are described under the general term *Pre-Cambrian*, by which is meant that they constitute a group unconformably beneath

what are regarded as the Lower Cambrian quartzites and slates of that area.

Briefly speaking, the structure of the metamorphic rocks of south-eastern Quebec may be said to consist of a series of approximately parallel ridges or anticlinals of Pre-Cambrian age, of which at least three have been definitely located. The most easterly of these is found along the boundary between Maine and the eastern limit of the Province, the middle is seen in the Stoke Mountain range and its expansion south-westerly to Lake Memphremagog, while the third constitutes the Sutton Mountain range and its prolongation to the north-east through the Province to Gaspé.

The intervals between these ranges are occupied by overlying sediments, mostly sandstones and slates of various colors, which, in places, are fossiliferous, and are now regarded and described in the Geological Report for 1886 as of Cambrian and Cambro-Silurian age. With these are associated areas, often of large size, of diorites, serpentines and granitic rocks. At several points, also, small, isolated and, at times, closely infolded basins of fossiliferous Silurian strata are observed. Between the most westerly of the old ridges and the St. Lawrence River the country is apparently occupied to a very large extent by rocks of Cambro-Silurian and Upper Cambrian age, much of which constitute what has for many years been regarded as the unaltered portion of the Quebec group, while the newer portion or that nearest the river is characterized, throughout a large extent, by fossils of the Hudson River and Utica formations.

The mineral wealth of this portion of Quebec is confined, for the most part, to the older systems, viz., the Pre-Cambrian and Cambrian, and though traces of various ores are occasionally found in the newer, in no case yet observed do these occur in quantity sufficient to be of economic value. Thus the workable deposits of *copper* ore exist principally in the Pre-Cambrian schists, though they have been located and worked, to a limited extent, in rocks of the overlying system. The ores of *iron* are found also mostly in the lowest series, and when found in the upper are largely confined to the volcanic portion, sometimes in the serpentines where veins often of large size occur. The *gold*, which, however, has not as yet been worked except as an alluvial deposit, pre-

sumably comes, to a very large extent at least, from quartz veins in the Cambrian slates and quartzites, though it may also occur in limited quantity in the Cambro-Silurian, and has been detected in metalliferous lodes in the older crystalline schists. The *asbestus* is almost entirely confined to the serpentines of the volcanic portion of what has been styled the Lower Cambrian, and which occurs probably as an alterative product from dioritic rocks, rich in olivine. The serpentine is generally associated with slates and hard sandstones of that system. The *chromic iron* is also confined to this belt of rocks. The *silver ores*, which, in places, carry a fair percentage of gold, apparently belong to the same horizon as the auriferous quartz veins, though small deposits of argentiferous galena are found with rocks of the upper part of the Silurian system in Gaspé; while the ores of antimony occur in a series of slaty and micaceous schists which are either low down in the Cambrian or lie near the summit of the underlying system.

The sources of mineral wealth more especially prominent at the present time in Eastern Quebec, and about which the greatest amount of interest is centred, are three in number, viz, copper, asbestus and gold, and as these bid fair to increase annually in importance, a brief glance at their history and geological relations may be of interest.

The first official reports on the copper deposits of the Eastern Townships by the Canadian Geological Survey were made by the late Sir W. E. Logan, in 1847, when attention was directed by him to the occurrence in the townships of Ascot, Upton and Inverness of that mineral, which places were recommended by him as localities for trial. Explorations proceeded rapidly and resulted in the location of numerous mines at various points, principally in what was then regarded as the metamorphic portion of the series, subsequently styled the Quebec group, and more especially in what was afterward regarded as the middle and upper divisions of that group, viz., the Lauzon and Sillery formations. These rocks were at that time supposed to be arranged in a series of generally parallel synclinals, extending north-east and south-west. In the first or more westerly of these were placed the copper areas of Roxton, Upton and Acton; in the second, those of Durham, Tingwick, Inverness, Chester, Halifax and Leeds; while the third, together with what was regarded as the double synclinal of Sutton

Mountain, included, in addition to rocks somewhat similar to those of the other two, great masses of serpentine, potstone and soapstone, and was seen in Bolton, Brompton and Broughton. The extensive deposits of Acton were supposed to belong to the upper or Sillery division.

Of the many copper mines which were started some twenty-five years ago, or when the copper boom was at its highest, very few are at present in operation. Of many of those which long since suspended operation, several causes for their discontinuance may be assigned. In some cases their failure was doubtless largely caused by a lack of size in the mineral veins; in others this was due presumably to the poverty or leanness of the ore as well, a conjunction which, taken in connection with the depressed condition of the copper market, rendered the profitable extraction of the mineral impossible. The difficulty of producing metallic copper under such adverse conditions was such that, although extensive smelting works had been erected at large expense at several points, these had of necessity to be abandoned, and have rapidly fallen into decay. The ores from the great lodes of Capelton have for years been shipped direct from the mines to the extensive acid works near New York, where they were treated directly for the manufacture of sulphuric acid, the residue being subsequently utilized for the extraction of the metallic copper, and in this way, owing to the great extent of the deposit and the facilities for mining and shipment, the mines at this place have continued to be worked at a profit. Within the last two years, sulphuric acid works have been started on the spot, by which means the expense of transferring so great a bulk of raw material can be avoided. Could this new industry be combined with that of the production of phosphate from the Ottawa valley, and the manufacture of artificial fertilizers established on the larger scale, still further benefit should accrue; since undoubtedly, in view of the present greatly impoverished condition of much of the wheat-producing lands of Ontario and Quebec, the use of these fertilizers must of necessity shortly become very considerable, or the profitable raising of wheat in these countries must become a thing of the past. In character, the copper ores of the townships may be classed under three heads, viz., the yellow sulphuret or chalcopyrite, with which is very frequently found a large percentage of iron pyrites; the vitreous or copper glance; and the variegated, other-

wise known by the names of purple copper, erubescite and peacock or horse-flesh ore. The deposits of the first have their greatest development in Bolton, Hatley and Ascot, the associated rocks being for the most part chloritic slates, dioritic rocks and sometimes serpentines. The important mines of this area are those south of the city of Sherbrooke, at Capelton, and the Huntington mine, in Bolton. The other varieties are more frequently found in the most westerly belt of cupriferous schists, as seen in the townships of Acton, Halifax, Leeds, etc., where they are generally associated with dolomitic limestones and nacreous or micaceous schists. Among the most celebrated mines of this area may be mentioned those of Acton and Harvey Hill, at both of which localities very extensive workings were carried on for many years.

The occurrence of copper lodes of such size as are found at several points, notably in that portion of Ascot, south of the city of Sherbrooke is probably, to some extent, due to the presence of dioritic dykes and masses, often of large extent, which penetrate the cupriferous schists of that area. This feature is also seen at several other points in connection with the deposits of Sutton, Bolton and Brompton, though, at times, the diorite has changed its character and passed into a more or less pure serpentine, the two kinds of rocks being frequently intimately associated.

The *asbestos* industry, which from its inception has steadily but rapidly increased in importance, bids fair to shortly become one of the leading mining industries of the Province. While the occurrence of this mineral has been known for many years and has been referred to in several of the early reports of the Geological Survey, its real economic value was apparently undiscovered till within a comparatively recent period. Although occurring to some extent with the serpentines which are associated with the limestones of the Laurentian district north of the River Ottawa, the development in this direction has not yet been sufficiently studied to warrant a clear expression as to the actual value of the deposits in this quarter, and the economic production of this mineral is as yet entirely confined in Canada, or at least in Quebec, to the belt of serpentine rocks which have been mentioned as forming a part of the volcanic belt of the Lower Cambrian of that Province.

The stratified rocks associated with the serpentines are black, green, grey and purple slates, with, occasionally, conglomerates, and sometimes beds of hard quartzose sandstone. The diorites, with which they are intimately associated, frequently form great mountain masses, as at Orford, Ham, Thetford, etc., and in texture are both massive and concretionary, while in color they range from shades of green to brown.

The serpentines are in places penetrated by dykes and sometimes considerable areas of a hard, whitish granite or granulite, often composed entirely of quartz and orthoclase felspar, but at times containing an admixture of mica. Whatever may be the age of these granite dykes, they certainly are newer than the rock with which they are now associated, since they are frequently seen to cut directly across the serpentines and to produce an alteration in the mass at the contact; and the view is held by many of those engaged in mining asbestos that the influence of the dykes upon the serpentine which they penetrate is apparently the same in regard to the favorable production of asbestos veins as the presence of diorite dykes on copper or other mineral-bearing strata in the production of metalliferous lodes.

In Quebec the serpentine extends for many miles, and is found at intervals from the Vermont boundary almost to the extremity of Gaspé, the most easterly outcrop in this direction being what is known as Mount Serpentine, on the Dartmouth River, about eleven miles from its outlet into Gaspé Basin. It presents a very large development in the Shick-Shock Mountains, where, at the south west extremity, a spur from the main mass cuts strata of hard dolomitic limestone and conglomerate in a dyke-like mass of 150 feet in width. Further west, though outcrops may exist in the great belt of comparatively unknown lands in rear of River Du Loup and Rimouski, its presence is not yet known in this direction till we reach the road leading south from St. Thomas to the boundary of Maine, about forty-four miles east of the Chaudière River. There several small knolls are found which apparently mark the eastern termination of the Cambrian volcanic belt. Further west, the serpentine occurs in limited areas with the dioritic masses of Cranbourne and Ware, and in several small outcrops on the Chaudière between St. Joseph and St. Francis; but in the Townships

of Thetford, Coleraine, Wolfestown and Ham a sudden and marked development is noticed, the rock forming great mountain masses, as seen about Black Lake and in Wolfe. Isolated areas are also found in the St. Francis River basin at Brompton, Melbourne and near Danville, but at no place is there such a great development visible as in Coleraine and Thetford. Other small areas, constituting part of the second or Stoke Mountain anticlinal, exist in the vicinity of Massawippi Lake, in Hatley, while the areas of Oxford and Bolton have already been indirectly referred to. While traces of asbestos are found at nearly every one of these localities, in many places the indications of it observed are insignificant, though over large areas, it must be confessed, the examinations yet made have been but cursory, and these may yet yield this peculiar and valuable mineral in abundance. It is, however, apparent that all serpentine is not equally rich in asbestos, for even in the most productive areas great differences in this respect are visible, and large portions of the belt are made up of what is called barren rock. As a general rule, the different kinds of serpentine, whether likely to be productive or not, can be determined by outward characters, either by peculiarities of weathering or by the texture and color of the mass of the rock itself. At Thetford and in the northern part of Coleraine, more particularly about Black Lake, certain peculiar conditions appear to have prevailed which have affected the great serpentine masses there, and led to the formation in large quantity of the mineralized form of asbestos, the veins here being not only very numerous, often interlacing the rock in all directions, but being also of large size, reaching a width at times of over six inches, while many of them range from two to four inches. In quality of fibre also a marked difference from that found at several other points is apparent by its greater softness and silkiness, which give it a special value for the many purposes of manufacture for which it is most in demand.

In its mode of occurrence asbestos appears to follow closely the principles which are known to affect metalliferous lodes in general. The veins have the aspect of segregation veins, the fibres in all cases, unless disturbed, being at right angles to the sides of the fissure, and in many cases, more especially in those of larger size, the fibre is broken near the centre by particles or grains of magnetic or chromic iron

which at times form small partings, affecting to some extent the value of the material. The containing rock shows the presence of numerous faults, as in other mineral localities, which throw the veins from side to side, and at times completely cut off the entire working face of the mine. The sides of the fissure are in such cases extensively slickensided, and often have streaks of coarse, woody-fibred or imperfect asbestos along the planes of fracture. The growing importance of this industry may be seen from the fact that the output of the mineral has increased from 50 tons in 1878 to over 4,500 tons in 1888, while the demand and value are rapidly improving.

Apparently confined almost exclusively to the same group of Cambrian rocks are the gold deposits of Eastern Quebec. First discovered in 1835 on the Chaudière River and its tributaries, this industry for a long time almost entirely appertained to this locality, though a second and possibly quite as important gold field has been worked to some extent for the last fifteen or twenty years in the extreme south-easterly part of the Province, in the Township of Ditton. The rocks which constitute not only those which we now regard as the original source of the gold of this section, but the overlying Cambro-Silurian slates and limestones as well, were for many years regarded as of Upper Silurian age, although their resemblance to the Cambrian gold-bearing series of Nova Scotia had been pointed out long since by Sir Wm. Logan, Dr. Selwyn, Dr. Hunt and others; and the only reason apparent why these rocks were allowed for so many years to remain in the Silurian system was that the great importance of the geological problems pertaining to the structure of the metamorphic portion withdrew attention almost entirely from this area.

The Silurian age of these sediments was first of all inferred by the officers of the Geological Survey from their supposed resemblance to the rocks of that system which had been studied in Gaspé, and it was supposed that these formed the western prolongation of the Gaspé limestone series. The presence, also, of areas of fossiliferous Silurian and Devonian strata at various points, which were in places so intimately associated with the rocks of the great eastern basin as at first sight to appear to form an integral portion of the series, supported this first view as to their apparent horizon. In the subsequent detailed study of the country

many of the masses of black slate and limestone were found to be fossiliferous, but the determination of their organic remains showed that these clearly belonged to a lower system and that they were in fact of the same horizon as the limestones and slates of Richmond and vicinity, whose Cambro-Silurian age had been determined some years before, while the stratigraphical working out of the district proved that these rocks were clearly superimposed upon the quartzites and slates of the Chaudière gold series and upon a similar set of rocks which extended along the border of Maine and New Hampshire.

Although for a long time after the first discovery of the gold in the Chaudière district its source was unknown, a series of investigations and assays, conducted by Dr. Hunt and Mr. Michel and published in 1866, clearly proved the auriferous character of many of the quartz veins of this district. Subsequent investigations have shown that the principle now recognized in the gold fields of Nova Scotia, viz., that the rich gold leads are for the most part confined to the vicinity of the anticlinals, in all probability applies to the similar rocks of Quebec; since at Ditton, where rich alluvial workings also exist, the gold is generally found in the greatest quantity in close proximity to the anticlinal areas which are there well defined. On the Chaudière the same principle will doubtless be found to apply, though here probably some of the anticlinals are overturned and their location will in consequence be more difficult.

The establishing of the horizon of these gold-bearing slates and quartzites as the equivalent of those so long worked in Nova Scotia is very important, since it should tend to make more simple the location of future operations in this direction. In the area occupied by these rocks most of the coarse gold yet found has been obtained in close proximity to well defined quartz leads, and much of it has without doubt been derived from the decomposition of these veins, some of which can be traced for a considerable distance; while over the great area of the overlying Cambro-Silurian sediments of the eastern basin, though gold is found at a number of points, and in fact can be washed from the gravels of nearly every stream, this gold is always fine in character, and its distribution is apparently due either to glacial action or to the conditions that succeeded that period, by which the sands and gravels

which are found over a large portion of this district were laid down. It is also probable that the frequent intrusions of dioritic rocks, seen both on the Chaudière, where the richest workings are situated, and at points through the Ditton area, have had some influence in determining the presence of gold in quantity in these districts, since there are considerable areas of Cambrian strata in this section from which but little, if any, gold has yet been reported.

The presence of old pre-glacial channels in many of the streams flowing into the Chaudière from either side has of late years been clearly established, and their lower portions have, in most cases where excavated, been found to contain much gold, both fine and coarse. These channels are often of considerable depth, and are filled with sand and gravel, the boulder clay being found at the top or near the present surface of the country. In the washings of the lower auriferous gravels much black sand is obtained. Although but few of these channels have been fully tested, the great richness of those of the Gilbert stream, and at several other points in the vicinity, testify to the great importance of this feature in the interests of the gold production of this area. No examinations for gold, of any scientific value, have yet been made in that portion of the Gaspé Peninsula occupied by rocks of Pre-Cambrian and Cambrian age, though reports of its presence along the flanks of the Shick Shock range have been current for years. The comparative inaccessibility of much of this country has hitherto deterred explorers from making a thorough trial of this section, though there are many points that should receive careful investigation both from the prospects of finding a new gold field and from the possible occurrence of asbestos and chromic iron in workable quantity in some part of the great serpentine areas about the heads of the Ste. Anne and Cascapedia Rivers. The presence of the latter mineral was reported from this locality many years ago.

The presence of gold in connection with the veins of rich argentiferous galena found on the upper waters of the Du Loup, a branch of the Chaudière River, in the Townships of Risborough and Marlow, is also of interest in this connection. The percentage of silver from these veins, varying from \$25 to over \$400 per ton, is such as to make this locality one of considerable economic importance, and further attention

will doubtless be directed to these upon their being made easily accessible by the present projected line of railway, which it is anticipated will cross this section. At this place also the richest ore by assay is found in close proximity to a dioritic dyke of considerable magnitude.

An attempt was made some half dozen years ago to extract the gold from the banks of clay, sand and gravel along the Du Loup, a tributary from the east of the Chaudière, by the hydraulic method. Owing to various unfavorable circumstances this enterprise does not appear to have been remunerative. The failure in this case should not, however, be regarded as conclusive, as determining the unprofitableness of such an enterprise, either on this stream or the many others in this locality, since from a series of trial washings over considerable areas made in 1851-52 under the supervision of an officer of the Geological Survey the results obtained from the Du Loup district were such as to fully warrant the employment of this method for the separation of the gold on a large scale. The occurrence of nuggets of large size, some of which had a value of over \$1,000, from the auriferous gravels of this district is a very important feature, since such coarse gold has not in all probability travelled any considerable distance from its source. Comparing the very low percentage of gold which is profitably extracted from the gravels of California and Australia by this method with the yield obtained in the experimental trials just referred to in the Chaudière district, there should, for that section, be a very handsome margin for profit over expenditure, provided the topographical features of these streams are such as to render the use of the hydraulic method possible; and it is certainly but reasonable to expect that the time is not far distant when with the aid of proper and skilled mining experience, and by the judicious expenditure of capital, the gold industries of this portion of the Dominion will be found to be equally valuable with those either of British Columbia or of Nova Scotia.

THE BOTANIST.—BEING THE BOTANICAL PART OF A COURSE OF LECTURES IN NATURAL HISTORY, DELIVERED IN THE UNIVERSITY OF CAMBRIDGE, TOGETHER WITH A DISCOURSE ON THE PRINCIPLES OF VITALITY, BY BENJAMIN WATERHOUSE, M.D., BOSTON, 1811.

By H. Beaumont Small, M.D.

There has recently come into my possession a copy of the first botanical lectures delivered in America. Just one hundred years ago, 1788, Doctor Benjamin Waterhouse was authorized by Harvard University to deliver to "such students as shall obtain permission from their parents or guardians, a course of lectures on Natural History." The book itself was printed in 1811, but the lectures are corrected up to, and dated, 1804.

It is somewhat out of place to take up the time of the meeting with such a paper, but the fact of these lectures being the beginning of the teaching of botany in this country, and the strangeness of some of the views expressed in them, may give it interest. I shall only refer as concisely as possible to some of the most striking oddities that have attracted my attention.

The lectures follow much the same course as those delivered at the present day. They commence with the seed and continue with a consideration of the stem, leaves, buds, blossoms and fruit. Interspersed are a history of the science of botany, sketches of the lives of Linnaeus, and other of the early botanists, and a history of botanic gardens. The last seems to have been suggested by the fact that such a garden was being talked of at the University at the time.

His opening remarks seem to imply that the lectures on other branches of natural history had been delivered, and that now he entered the field of botany. They also indicate the novelty of the subject:—

"As natural history is a subject that has excited some attention for more than a dozen years past at the University in this place; and as that branch of it denominated botany has lately become a topic of conversation, and likely to become more so, we have thought that it would conduce to good, if we laid before the public a few essays on this pleasant department of nature."

Further on we learn what he proposes:—"Some of the leading principles of this charming science we mean to extend through a series

of monthly essays. We shall give our doctrine a dress partaking more of the popular than of the scientific garb."

His tenets he states plainly :—"We avow Linnaeus to be our lawful chief ; and his *Philosophia Botanica* our rallying point and standard."

In describing the seed, he likens it to an egg, and states that they are "in structure, essentially the same. It (the seed) is not a dead substance like a pebble or a pearl ; but it is a body regularly organized and arranged harmoniously into a system of vessels, glands and membranes ; and it is, moreover, like a prolific egg, alive, or at least in a state of fitness to be acted upon by certain external agents, which agents are fire (caloric), air and water." After further comparisons, he continues :—"there is a small quantity of vital air in a sac, bladder or partition at the big end of every bird's egg ; and we presume that there is a small portion of the same kind of fluid in every seed ; or it may be oxygen in a concentrated state, which is afterwards combined with caloric in the process of incubation."

As to the food of plants, he says :—"From numerous well conducted experiments, it appears that a *mucilage*, produced by the decomposition of vegetable and animal recrement, constitutes the food or aliment of plants. This mucilage is formed from stable manures, from rain water putrified, from dew, as well as from dead animals and vegetables. To reconcile the doctrine taught by some, that *salt* is the active principle in manures, it should be remembered that putrification has two stages ; the first converts animal and vegetable substances into a mucilage, and the second converts that mucilage into one or more species of salt."

Describing the structure of plants, he is generally very correct, but some of the parts were hardly understood, for instance :—"The principal vessels are of two kinds, *tubes* and *cells*. The tubes run from the roots to the different parts of the plant. they terminate in the *cells*, which cells contain the peculiar juices of the plant. The tubes contain the sap-juice."

He also says :—"In the root, the tubes are opened only at the extreme point, and fluids cannot be absorbed anywhere else."

The *pith*, particularly, is remarkable. "It is a spongy or vesicular substance, according to Linnaeus, essential to the life of the vegetable. It gives birth to the buds. Some botanists of the first rank believe that it is, in a plant, what the brain and spinal marrow are in the inferior order of animals."

The vascular system is stated to be made up of three kinds of vessels:—"The sap vessels, which convey the sap-juice. They run perpendicularly, and pass principally between the wood and the bark; and though imperceptible, they must pervade other parts.

"The proper vessels. which contain the peculiar scented fluids.

"The air vessels. These are found in the wood and in the alburnum, but not in the bark. They carry other fluids besides air."

In describing buds, he recognizes the fact that some give rise to the leaf and some to the flower, but continues:—"As many plants have no buds, ... it is evident that buds are not parts essential to a vegetable."

"Close observers of nature have remarked that, about midsummer, there is a kind of pause in vegetation, for perhaps a fortnight; and it is believed that leaf buds may be changed into flower buds, and flower buds into leaf buds. The probability of this idea is confirmed, says the ingenious author of 'The Botanic Garden' (Darwin), by the curious conversion of the parts of a flower into green leaves."

The leaves he terms, as we do to-day, the lungs of the plant, and describes two sets of vessels in them, as in the human body, one to convey the sap to the surface to be acted upon, the other set to carry back the improved fluid. The varnish on leaves he claims to be beeswax.

His knowledge of the anatomy of the parts of the flower was, of course, very perfect, modelled as it was on the teachings of Linnaeus, but whenever he launches into theory he is lost—for instance, in discussing the secretions of the flowers:—

"An insect is nourished by honey. May it not be needful that the flower, during the process of fructification, should be nourished by honey from the nectaries? Sugar is formed in the joints of the canes, for, perhaps, a similar purpose."

The production of wax is also explained :—

“ This powder (*pollen*) is collected by the bees ; and is formed by some secret process in their bodies into wax ; which is a singular species of vegetable oil, rendered concrete by a peculiar acid in the insect.”

In discussing the uses of the several parts of the flower he says :—
 “ We cannot believe, with most botanists, that the corolla has no other use in the vegetable economy than merely to cover and guard the sexual organs. An artery belongs to each portion of the corolla ; which conveys the vegetable blood to the extremities of the petal, there exposing it to the *light* and to the *air*, under a delicate membrane ; when it often changes its color, and is seen beautifully in partly-colored tulips and poppies. It is presumed that this breathing and circulating structure has for its end the sustenance of the anthers and stigma ; as well as for the elaboration of honey, wax and essential oil ; and for perfecting the prolific powder.”

He thus describes Linnaeus's theory of fructification :—“ The medullary part of the plant, that is to say, the pith, must be joined with the external or cortical part, for the purpose of producing a new one. If the medulla be so vigorous as to burst through its containing vessels and thus mix with the cortical part, a bud is produced ; otherwise, the medulla is extended until it terminates in the pistillum ; and the cortical part is likewise elongated till it terminates in the antheræ.”

Such are a few of the lessons taught to our first botanists. Many others might have been instanced, but these are sufficient to give an idea of the obscurity of many of the points. In the anatomy of the plants he is as proficient as we are at the present day, and the descriptions are exactly such as will be found in our text books ; it is in the physiology of vegetable life that he fails, and it is here that all the progress has been made since that time.

One thing particularly noticeable is the excellence of the language and composition, and the care shown in the arrangement of each lecture ; also the success of his efforts to make them interesting and attractive. To give you an idea of this feature of his work, it will not be out of place to conclude with the following extract from one of his lectures.

He refers to the discontent of human nature, and continues, alluding to man :—"He is apt to compare himself to the plant, and to repine at the difference. He observes the pride of our forests, shedding his leaves in the autumn ; and sees them renovated in the spring, and going on re-clothing and flourishing through ages, while he, surveying his decayed and nerveless limbs, sighs out in despair :—"There is no returning spring for me !" The plant is annually renovated, while the lord of the earth, with all his towering faculties, withers and sinks. But this is judgment by sense and sight alone.

Believe the muse : the wintry blast of death
Kills not the buds of virtue ; no, they spread
Beneath the heavenly beam of brighter suns,
Thro' endless ages, into higher flowers.'"

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EXCURSION TO KINGSMERE.

The first general excursion of the season was held on May 18th. The opportunity it afforded for a day's outing was taken advantage of by about one hundred and forty of the members and their friends, thus making it the most largely attended excursion ever held by the club. King's Mountain, the highest of the Laurentian Hills in this neighborhood, was the objective point, and the route lay along what is known as the "lower road," which leads through one of the most picturesque stretches of country in this vicinity. Fairy Lake, lying to the south of the road, is aptly named, for it is a most beautiful and dainty little sheet of water, fringed with trees, and nestling snugly among the surrounding hills. Further west the road skirts the base of a bold jutting spur of the mountains, while stretching away towards Aylmer, lies a broad flat plain of excellent farming land, dotted with well kept and prosperous-looking homesteads. All along the road the air was heavy with the perfume of lilacs and late apple blossoms, and the Bobolinks hovering over the luxuriant green meadows made the air ring with their liquid musical notes, whilst butterflies of varied hues added further brilliance to the sun-lit landscape. With such sights and sounds to divert their attention, the excursionists hardly realized that it was "ninety in the shade," and enjoyed the drive in spite of the heat, but,

when the foot of the mountain was reached, they did not forget that it was lunch time, and before long had reduced the weight of their baskets to such an extent that they could easily be carried up the steep mountain road to the rendezvous at the west end of Kingsmere.

After a short rest, a large number of the excursionists ascended the mountain by the winding path prepared for the Princess Louise, while two of the more adventurous climbed the face of the hill, a steep and arduous climb, especially on such a hot day. Here, spread out before them, and stretching for miles to the east, south and west, lay the beautiful Ottawa Valley, diversified by hill and plain, woodland and open country, and dotted with scattered villages, hamlets, and homesteads. Like molten silver under the now hazy sunlight, ran the Ottawa, sweeping in grand curves across the landscape, here widening out into a majestic lake, and there stretching its tributary arms to the north and south. In the middle distance rose the towers and spires of Ottawa and her twin sister, Hull, and to the north, as far as the eye could reach, lay the "everlasting hills," their rugged deformities of outline but little softened by their enfolding mantle of green forest.

After enjoying to the full the many beauties of the scene, as well as the delightfully cool breeze wafted from the lake at Aylmer, the party started for the rendezvous and found it a good deal easier coming down than going up.

When all had assembled at the foot of the hill, they were photographed by Mr. Jarvis, who is a member of the club, after which the President, Dr. R. W. Ells, made a short but pithy address, which was received in a manner that showed the popularity of the new president of the club. He was followed by Mr. Jas. Fletcher, who, as leader of the entomological branch, made some very interesting remarks on the insects collected during the day. Mr. H. M. Ami then spoke in his usual interesting way of the rocks which form the Laurentian Hills, and which belong to the oldest geological formation known; and Mr. R. B. Whyte brought the proceedings to a close with a short but clear account of the structure and habits of some of the most noteworthy plants found in bloom.

A start was made for home, by way of Chelsea, at 5.30 p.m., and after a pleasant drive in the cool air of the evening, enlivened by some

fine impromptu singing, the party reached the city about 8.30, and all agreed, as they dispersed, that, in spite of the heat and the mosquitoes, they had thoroughly enjoyed their day's outing.

The horses employed suffered considerably from the intense heat, but everything possible was done to lighten their labors, the occupants of the vans alighting and walking whenever a hill or a sandy piece of road was reached.

W. A. D. L.

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EXCURSION TO MONTEBELLO.

The second general excursion of the season was, owing to the threatening weather of the 22nd June, the day fixed for it, the smallest in point of attendance ever held by the club. Only twelve were present, but of these five were leaders, representing the branches of botany, entomology, ornithology and general zoology. It was intended to go by steamer "Empress" to Buckingham, P. Q., and investigate the natural history of that locality, but it was found impracticable to land there, owing to the high water. Thus the little party, who had braved the rain, were compelled to seek a field for their researches farther down the river, and they chose Montebello. The weather in the meantime had turned out quite fine, and the excursionists, after exploring their lunch baskets with very satisfactory results, set out to do the same by the surrounding country. They found the hill behind the village so picturesque at a distance none the less so on a nearer approach. With its beautiful little brooks tumbling over moss-covered rocks, and winding in and out amongst tangled thickets and open forest glades, its artificial, but apparently natural, fountain, throwing a jet of water thirty feet high, in one of the most secluded spots of the mountain side, and its wealth of birds, insects, and flowers, all declared it to be one of the most beautiful and interesting collecting grounds ever visited by the club. From the hill-top a fine view can be had of the river and the surrounding country, with the village, and the Papineau mansion and grounds, in the foreground. Several rare and beautiful plants of the orchid family were found by the botanists, and the workers in the other branches had good reason to be satisfied with the result of their labors. A feature of

the excursion in which much interest was taken was a competition among the younger members of the party in plant collecting, for which three prizes were offered. The first was won by Miss Marion Whyte, with 97 species ; the second by Miss Lillie Ballantyne, with 73 ; and the third by Miss Ida Whyte, with 46. Short addresses were given on the boat, while returning, by Mr. Whyte on the plants collected during the day, by Mr. MacLaughlin on the insects he had captured, and by Mr. Lees on the birds he had observed. The steamer reached the wharf about 8 p.m., and the party dispersed, somewhat tired, but thoroughly satisfied with their day in the woods and on the water.

W. A. D. L.

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REPORT OF THE CONCHOLOGICAL BRANCH, FOR THE YEARS 1887-88.

To the President and Council of the Ottawa Field-Naturalists' Club.

GENTLEMEN,—As no report from this branch was presented last year, what I now have the honor to submit covers observations made in 1887 as well as 1888.

The Ottawa was lower in 1887 than in any year since 1881, and as a consequence the many beautiful shells which occur in that river were easily accessible. From August to October numerous visits were paid to Duck Island, the metropolis of the Unionidæ in this vicinity, and large collections of fine shells were there obtained. *Unio occidentalis* was abundant along both shores of the lower half of the island ; and from the thousands of this species visible in the shallow water, selections were made which rival, if they do not surpass, in variety and richness of coloring, any shells procurable from any inland waters in the world. Indeed few sea shells equal in beauty this remarkable species, which exists in such abundance at our very doors. Why the shell should vary so greatly in color under precisely similar circumstances is a question not easily solved. Other species from Duck Island vary greatly in form, though not in color ; while others again are remarkably constant ; but all the shells found in the vicinity are much finer than I have ever observed the same species to be in other localities.

Our commonest *Unio*—the commonest, in fact, of the whole Atlantic drainage ; *Unio complanatus*—is there found in forms very

different from those occurring elsewhere. One of these, which is undoubtedly entitled to rank as a distinct variety, was first found in 1881; and no specimens were obtained in any year since until 1887. It seems confined to the lower part of the island, and is least rare along the southern shore. The shell is very large for the species, and is marked by numerous, distinct, dark-green rays. The beauty and comparative rarity of this form render it one of the most desirable of our shells. I can suggest no reason why it should so widely differ from the ordinary *Unio complanatus* found in the same locality.

It will doubtless be remembered that Mr. Heron included *Unio alatus* in his list of Ottawa shells, but without stating where it was found. I never observed it until September, 1887, when I obtained a few living examples on the south shore of Duck Island. Mr. Ami informs me that he has taken shells of this species near the same locality, at the mouth of Green's Creek.

Late in the season a great number of *Unio ellipsis* became stranded on shoals opposite Templeton Wharf and perished. Many larger specimens than ever previously noted were observed among the dead shells. One remarkably large and beautiful living example of *Margaritana undulata* was collected in the same locality, as were also a dozen beautiful specimens of *Unio gracilis*.

A list of the *Unionidae* found at Duck Island will probably be of interest. The following are the shells of this family which I have observed to occur there:—

<i>Unio occidens</i> , Lea.	<i>Unio gracilis</i> , Barnes.
<i>Unio complanatus</i> , Solander.	<i>Unio ellipsis</i> , Lea.
<i>Unio alatus</i> , Say.	<i>Margaritana undulata</i> , Say.
<i>Unio gibbosus</i> , Barnes.	<i>Anodonta fluviatilis</i> , Dillwyn.
<i>Unio borealis</i> , A. F. Gray.	<i>Anodonta undulata</i> , Say.
<i>Unio rectus</i> , Lamarck.	

The pond on the island teems with the smaller forms of fresh water shells—*Sphaeria*, *Amnicolæ*, *Limnææ* and *Planorbis*. On the whole, Duck Island is undoubtedly the richest collecting ground within the sphere of the Club's operations.

Another locality rich in shells of an entirely different character is Meech's Lake. A few years since two specimens of a very large form

of *Planorbis bicarinatus* were collected there, and noted in one of the reports of this branch. A visit to the lake in August, 1887, resulted in the discovery of a locality in which this variety occurs in great abundance, associated with very large specimens of the shell we have so long called *Physa Lordi*. This locality lies on the west shore of the lake near the house of a farmer named Gillian. One striking peculiarity noticed among the *Planorbis* was that about five per cent. of the animals were of just such a reddish tint as the most highly colored shells of *Unio occidentalis*. Specimens which I kept living for a few weeks were losing their rich color when they died. I refer to this with a view of directing attention to the danger of basing any specific differences on the color of the animal itself. This *Planorbis* from Meech's Lake is of six or eight times the cubical capacity of the same species as found in the Rideau and Ottawa. In our woodland streams occurs a third form, which is stunted in growth and much distorted, owing, no doubt, to the vicissitudes it has to undergo in localities where at times there is a flood running and at other periods scarcely a drop of water.

Another shell that is well worthy of note is found in abundance in the Rideau River and less commonly in several other streams. It is the species called by authors *Planorbis corpulentus*. The true *corpulentus* described by Say is an entirely different shell. That great naturalist found his types in the lake of the Woods, in what is now part of the Province of Ontario. They were lost on the return journey, and until Mr. James Fletcher collected specimens in the original locality in 1885, it was, it would appear, generally believed that Say made some mistake in the figure he gave of the species. Subsequent writers on shells professed to know more about the matter than Say, and gave the name "*corpulentus*" to an entirely different shell—the same species undoubtedly which occurs so commonly in the Rideau from the Rifle Range upward at least to Black Rapids. All along this reach of water the shell occurs in company with the form of *Planorbis trivolvis* so common everywhere in this vicinity. I have found the two associated not only in the Rideau but in Nepean Bay, Brighams Creek, and the Pêche River, in Masham. The shells are in my opinion quite distinct. What I consider a distorted form of the larger shell has been described by Mr. Whiteaves from Montreal, and named *Planorbis macrostomus*. The same form is

common in the ponds to the north of St. Louis Dam, near the Experimental Farm.

Mr. Harrington has collected in moss a great number of our smaller shells. One new to our list is *Vertigo ventricosa*, Morse. I thought I had the shell some years ago, but my specimens were merely *V. ovata*, with only one of the labial teeth developed. Since finding the species among Mr. Harrington's shells, I have observed it among my own, mixed with *V. gouldii*. The difference is not easily perceptible under a hand lens, but with the microscope it is quite apparent. *V. ventricosa* has nearly a whorl less, and is considerably less slender. I think it is more common on the Hull side of the Ottawa, as it is there I collected most of the shells among which I have noticed *V. ventricosa*.

In conclusion I have to express my regret that with the present report must close my active connection with this interesting study. Happily the club now includes among its members not a few gentlemen who have all the qualifications necessary to carry on properly the work of the Conchological Branch.

F. R. LATCHFORD,
Leader.

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SPRING REPORT OF THE ORNITHOLOGICAL BRANCH.

To the President and Council of the Ottawa Field-Naturalists' Club :

GENTLEMEN,—In presenting their Spring report, the leaders of the Ornithological Branch must congratulate you on the increased interest shewn by the members of the Club in the work of this branch during the present season. Including the leaders, there have been seven observers in the field who sent in lists of their observations. The results of their work are embodied in the subjoined list of Spring arrivals. Notwithstanding these facts, however, only one addition has been made to the list, which seems to indicate that the field in this direction has been pretty thoroughly gone over, though much still remains to be done in working out the life histories of the birds of this district.

The addition to the list is:—*Falco peregrinus anatum* (Bonap.), Duck Hawk. A specimen of this bird was observed by Mr. G. R.

White and several others, on 28th April, flying low over the Rideau Rifle Range, but was not shot.

The following are some of the more noteworthy finds of the season :—

Nyctala Tengmalmi Richardsoni, Richardson's Owl; seen Feb. 21st, in a garden near the city. It allowed a near approach, and, in consequence, was easily identified by Messrs. N. F. Ballantyne and W. A. D. Lees.

Ampelis garrulus, Bohemian Waxwing. Mr. W. Macoun reports having seen a flock of 20 or 30 of these birds, near St. Andrew's Church, on 2nd June. This is an unusual occurrence at this time of year, the bird being a rather uncommon winter visitor here.

Spizella pusilla, Field Sparrow; observed in the corner of a pasture field on the Hurdman Farm, near the city, on 16th June, by Mr. Lees, and on 23rd June, by Messrs. Lees and Ballantyne. On both occasions it was accompanied by a Chipping Sparrow (*Spizella socialis*), and was heard singing. Being seen at a distance of only a few feet with a good glass, its pink bill could be easily distinguished.

Cistothorus palustris, Long-billed Marsh Wren; found common, and breeding, in the marshes along the Rideau River, from fifteen to twenty miles from the city, by Messrs. A. G. Kingston and C. E. Chubbuck, on 20th June. After examining several nests, Mr. Kingston found one containing six eggs, two of which he took. On 30th June, Mr. Lees examined about a dozen nests in the same locality, but found no eggs, although the birds, in most cases, loudly asserted their claims to ownership of the nests. Mr. Kingston thinks he also saw one specimen of the short-billed species (*C. stellaris*), but could not make sure of it.

Unusually large numbers of Pine Grosbeaks and of American, and White-winged, Crossbills (the latter predominating) were observed here during the winter, and the Hudsonian Chickadee was noticed to be tolerably common in Dow's Swamp. The American Crossbills were also seen on 19th June, a rather unseasonable time for winter birds, and a Sparrow Hawk was observed on 26th January, the earliest previous record being 7th April.

On 28th April, 18 hawks were seen, soaring over the city at a great height, and moving gradually northward in large circles, but keeping together in a body.

The past Spring has been an unusually early one in bird migration, 35 new records having been made, and 8 earliest previous ones tied.

Following is a list of the dates on which the birds were first observed. Those marked (*) are the earliest recorded by the Club :—

- | | | |
|-------|-----|---|
| Jan. | 1. | <i>Parus atricapillus</i> , Chickadee. |
| " | 2. | <i>Bonasa umbellus togata</i> , Canadian Ruffed Grouse. |
| " | 2. | <i>Cyanocitta cristata</i> , Blue Jay. |
| " | 2. | <i>Plectrophenax nivalis</i> , Snowflake. |
| " | 6. | <i>Pinicola enucleator</i> , Pine Grosbeak. |
| " | 12. | <i>Loxia leucoptera</i> , White-winged Crossbill. |
| " | 12. | <i>Acanthis linaria</i> , Redpoll. |
| " | 13. | * <i>Corvus americanus</i> , American Crow. |
| " | 13. | * <i>Spinus tristis</i> , American Goldfinch. |
| " | 13. | <i>Lanius borealis</i> , Northern Shrike. |
| " | 13. | <i>Sitta carolinensis</i> , White-breasted Nuthatch. |
| " | 15. | <i>Spinus pinus</i> , Pine Siskin. |
| " | 20. | <i>Loxia curvirostra minor</i> , American Crossbill. |
| " | 26. | * <i>Falco sparverius</i> , American Sparrow Hawk. |
| Feb. | 3. | <i>Parus hudsonicus</i> , Hudsonian Chickadee. |
| " | 11. | * <i>Carpodacus purpureus</i> , Purple Finch. |
| " | 12. | <i>Accipiter atricapillus</i> , American Goshawk. |
| " | 17. | * <i>Dryobates pubescens</i> , Downy Woodpecker. |
| " | 21. | <i>Nyctala tengmalmi richardsoni</i> , Richardson's Owl. |
| Mar. | 2. | <i>Otocoris alpestris</i> , Horned Lark. |
| " | 6. | * <i>Junco hyemalis</i> , Slate-colored Junco. |
| " | 19. | <i>Accipiter velox</i> , Sharp-shinned Hawk. |
| " | 22. | <i>Merula migratoria</i> , American Robin. |
| " | 22. | * <i>Sialia sialis</i> , Bluebird. |
| " | 23. | * <i>Quiscalus quiscula æneus</i> , Bronzed Grackle. |
| " | 23. | * <i>Spizella monticola</i> , Tree Sparrow. |
| " | 23. | * <i>Melospiza fasciata</i> , Song Sparrow. |
| " | 27. | * <i>Spizella socialis</i> , Chipping Sparrow. |
| " | 31. | <i>Dryobates villosus leucomelas</i> , Northern Hairy Woodpecker. |
| " | 31. | * <i>Molothrus ater</i> , Cowbird. |
| April | 1. | * <i>Sturnella magna</i> , Meadowlark. |
| " | 1. | * <i>Scolecophagus carolinus</i> , Rusty Blackbird. |
| " | 5. | <i>Glaucionetta clangula americana</i> , American Golden-eye. |
| " | 8. | <i>Sayornis phæbe</i> , Phæbe. |
| " | 9. | * <i>Anas obscura</i> , Black Duck. |
| " | 9. | * <i>Ceryle alcyon</i> , Belted Kingfisher. |

April 10. **Ammodramus sandwichensis savanna*, Savanna Sparrow.

- " 10. *Tachycineta bicolor*, Tree Swallow.
- " 11. *Sphyrapicus varius*, Yellow-bellied Sapsucker.
- " 11. *Agelaius phoeniceus*, Red-winged Blackbird.
- " 11. *Pooecetes gramineus*, Vesper Sparrow.
- " 11. **Zonotrichia albicollis*, White-throated Sparrow.
- " 11. *Certhia familiaris americana*, Brown Creeper.
- " 11. *Regulus satrapa*, Golden-crowned Kinglet.
- " 12. *Circus hudsonius*, Marsh Hawk.
- " 12. **Buteo lineatus*, Red-shouldered Hawk.
- " 12. American Goldfinch (summer plumage).
- " 12. **Troglodytes hiemalis*, Winter Wren.
- " 13. *Larus argentatus smithsonianus*, American Herring Gull.
- " 13. *Falco columbarius*, Pigeon Hawk.
- " 13. *Progne subis*, Purple Martin.
- " 14. *Colaptes auratus*, Flicker.
- " 14. **Turdus aonalaschke pallasii*, Hermit Thrush.
- " 16. *Troglodytes, ædon*, House Wren.
- " 16. **Regulus calendula*, Ruby-crowned Kinglet.
- " 18. *Lophodytes cucullatus*, Hooded Merganser.
- " 18. **Passerella iliaca*, Fox Sparrow.
- " 19. *Anas boschas*, Wood Duck.
- " 19. **Branta canadensis*, Canada Goose.
- " 19. **Gallinago delicata*, Wilson's Snipe.
- " 19. **Totanus flavipes*, Yellow-legs.
- " 19. **Buteo borealis*, Red-tailed Hawk.
- " 19. **Chelidon erythrogaster*, Barn Swallow.
- " 19. *Sitta canadensis*, Red-breasted Nuthatch.
- " 21. *Buteo latissimus*, Broad-winged Hawk.
- " 22. **Picoides arcticus*, Arctic Three-toed Woodpecker.
- " 22. *Turdus fuscescens*, Wilson's Thrush.
- " 23. *Pandion haliaëtus carolinensis*, American Osprey.
- " 23. *Clivicola riparia*, Bank Swallow.
- " 24. *Actitis macularia*, Spotted Sandpiper.
- " 27. *Melospiza georgiana*, Swamp Sparrow.
- " 28. **Falco peregrinus anatum*, Duck Hawk.
- " 28. **Chætura pelagica*, Chimney Swift.
- " 28. *Harporhynchus rufus*, Brown Thrasher.

May 1. **Lanius ludovicianus excubitorides*, White - rumped Shrike.

- " 2. **Seiurus aurocapillus*, Ovenbird.
- " 4. *Melanerpes erythrocephalus*, Red-headed Woodpecker.
- " 5. *Mniotilta varia*, Black and White Warbler.
- " 6. **Asio accipitrinus*, Short-eared Owl.
- " 6. **Tyrannus tyrannus*, Kingbird.

- May 6. **Vireo gilvus*, Warbling Vireo.
 " 6. *Dendroica aestiva*, Yellow Warbler.
 " 7. *Empidonax minimus*, Least Flycatcher.
 " 7. *Icterus galbula*, Baltimore Oriole.
 " 7. *Zonotrichia leucophrys*, White-crowned Sparrow.
 " 7. *Habia ludoviciana*, Rose-breasted Grosbeak.
 " 7. **Vireo solitarius*, Blue-headed Vireo.
 " 7. *Dendroica coronata*, Myrtle Warbler.
 " 8. *Clangula hyemalis*, Old-squaw.
 " 8. **Vireo flavifrons*, Yellow-throated Vireo.
 " 8. *Dendroica maculosa*, Magnolia Warbler.
 " 9. *Myiarchus crinitus*, Crested Flycatcher.
 " 9. *Compothlypis americana*, Parula Warbler.
 " 9. *Dendroica caerulescens*, Black-throated Blue Warbler.
 " 9. **Dendroica pensylvanica*, Chestnut-sided Warbler.
 " 9. *Dendroica blackburniae*, Blackburnian Warbler.
 " 10. *Colymbus holboellii*, Holboell's Grebe.
 " 10. *Totanus solitarius*, Solitary Sandpiper.
 " 10. **Coccyzus erythrophthalmus*, Black-billed Cuckoo.
 " 10. *Contopus virens*, Wood Pewee.
 " 10. *Ampelis cedrorum*, Cedar Waxwing.
 " 10. **Galeoscoptes carolinensis*, Catbird.
 " 11. *Antrostomus vociferus*, Whip-poor-will.
 " 11. *Dendroica virens*, Black-throated Green Warbler.
 " 12. *Vireo olivaceus*, Red-eyed Vireo.
 " 12. *Seiurus noveboracensis*, Water Thrush.
 " 12. *Setophaga ruticilla*, American Redstart.
 " 12. *Anthus pensylvanicus*, American pipit.
 " 14. *Trochilus colubris*, Ruby-throated Hummingbird.
 " 14. *Dolichonyx oryzivorus*, Bobolink.
 " 14. *Turdus mustelinus*, Wood Thrush.
 " 15. *Chordeiles virginianus*, Night Hawk.
 " 15. *Geothlypis trichas*, Maryland Yellow-throat.
 " 17. *Accipiter cooperi*, Cooper's Hawk.
 " 17. **Contopus borealis*, Olive-sided Flycatcher.
 " 17. *Piranga erythromelas*, Scarlet Tanager.
 " 17. *Dendroica tigrina*, Cape May Warbler.
 " 17. *Dendroica castanea*, Bay-breasted Warbler.
 " 19. *Philohela minor*, American Woodcock.
 " 19. *Petrochelidon lunifrons*, Cliff Swallow.
 " 19. *Sylvania canadensis*, Canadian Warbler.
 " 20. *Agialitis vocifera*, Killdeer.
 " 22. **Geothlypis philadelphia*, Mourning Warbler.
 " 24. *Botaurus lentiginosus*, American Bittern.
 " 26. *Anas discors*, Blue-winged Teal.
 " 27. *Vireo philadelphicus*, Philadelphia Vireo.
 " 27. *Dendroica striata*, Black-poll Warbler.

- May. 27. *Sylvania pusilla*, Wilson's Warbler.
 " 30. *Turdus ustulatus swainsonii*, Olive-backed Thrush.
 June 2. *Ampelis garrulus*, Bohemian Waxwing.
 " 4. *Nycticorax nycticorax naevius*, Black-crowned Night
 Heron.
 June 8. *Ardea herodias*, Great Blue Heron.
 " 16. *Spizella pusilla*, Field Sparrow.
 " 19. *Loxia curvirostra minor*, American Crossbill.
 " 20. *Cistothorus palustris*, Long-billed Marsh Wren.
 " 23. *Passerina cyanea*, Indigo Bunting.
 " 23. *Helminthophila ruficapilla*, Nashville Warbler.

WM. A. D. LEES, }
 JOHN MACOUN, } *Leaders.*
 GEO. R. WHITE, }

Ottawa, 1st July, 1889.

CORRECTION.—In the report of the Ornithological Branch for 1888 (NATURALIST, Vol. II, p. 151, March, 1889), in line 21, for "new" read "rarer."

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 BOOK NOTICES.

ON NEMATOPHYTON AND ALLIED FORMS FROM THE DEVONIAN (ERIAN) OF GASPÉ AND THE BAIE DES CHALEURS, by Prof. D. P. Penhallow, (with introductory notes, by Sir William Dawson, F.R.S). Trans. Roy. Soc. Can., Vol. VI, 1889, p. 27.

This paper contains an able exposition of the new facts and relations concerning this obscure tree-like plant-remain which has caused so long and so interesting a discussion between Prof. Carruthers, Sir Wm. Dawson and others both in the old and the new world.

Part I opens with an "Introductory note," by Sir Wm. Dawson, in which he gives an historical sketch of the discovery of those fossil plants which were at one time referred to the genus *Prototaxites*. Sir Wm. Logan, Sir Wm. Dawson, Dr. G. M. Dawson, Prof. Kennedy, Dr. Bell and others had discovered them in Canada, whilst Dr. Henry Hicks and Prof. Etheridge had also obtained them in shales of the Ludlow formation, and from the "Denbighshire grits." The geological relations of the strata in which these fossil plants occur are then discussed, the species of fossil fishes *Coccosteus*, *Ctenacanthus*, *Leptacanthus* and *Machæracanthus* are enumerated and notes are given on other species of fossil remains.

Part II. This part deals with the "notes on the fossils" in question in which Prof. Penhallow reviews the literature of the subject in a clear and lucid manner, giving a full description of (a) the "external characters" of *Nematophyton Logani*, Dn. and (b), its "internal structure," which is the result of the examination of a large series of microscopic slides of sections taken in every direction imaginable. Longitudinal sections show that the principal part of the structure is composed of tubular cells of indeterminate length. Cross sections, on the other hand, reveal a series of large rounded cells with "intercellular areas," which are more or less occupied by a system of much smaller, rather thin-walled filamentous cells. More minute details of the structure and arrangements of parts are given, which altogether furnish means of recognizing the general relations and characters of the genus which Sir Wm. Dawson proposes. In this genus *Nematophyton* three species are included: *Nematophyton Logani*, (Dawson); *Nematophyton laxum*, (Penhallow); *Nematophyton Hicksi*, (Etheridge). Plates I and II of this volume of the Transactions of the Royal Society of Canada contain eight figures giving the microscopic characters of the species which are reproduced by photo-lithography.

NOTE.—At the last meeting of the Royal Society. of Canada, May, 1889, Prof. Penhallow read a paper entitled "Notes on Erian Plants," in which he offers additional notes upon *N. Logani* and also revises the descriptions of *Nematoxylon crassum* and *Celluloxylon primævum*. The former he shows to be a species of *Nematophyton* for which he retains the specific name of *crassum*. The latter is also shown to be a highly altered form of *Nematophyton*, and he refers it to *N. crassum*. A complete revision of the genus is also given.

H. M. A.

ON SOME REMARKABLE ORGANISMS OF THE SILURIAN AND DEVONIAN
ROCKS IN SOUTHERN NEW BRUNSWICK. By G. F. Matthew, M.A.

In Vol. VI of the Trans. Roy. Soc. Can., p. 49, *et seq.*, Mr. Matthew figures (plate IV) and describes six very remarkable organisms from the fossiliferous strata of southern New Brunswick, which make an interesting addition to our knowledge of the Silurian and Devonian fossils of that Province. The paper opens with a revised and extended

description of the Silurian fish, *Diplaspis Acadica*, which was described by Mr. Matthew for the first time in Vol. II of the *Canadian Record of Science*, p. 251. The description of the related genera and species, as well as the geological horizon from which the species comes, are next given. Then follows the description of a new species of *Ceratiocaris* (McCoy), or *Phinocaris* (Clarke), viz., *C. pusillus*, obtained at the same locality as the *Diplaspis*, viz., Cunningham Brook, near Westfield Station, N. B. With these there was also found the type of a new genus of crustacean allied to certain forms of Packard's sub-order *Synziphosura*, and for which Mr. Matthew proposes the generic designation *Bunodella*, and describes the species as *B. horrida*.

The second part of the paper contains descriptions of the Devonian forms, and includes: 1, One orthopterous insect; 2, a chitinous grub; and, 3, a new crustacean. The wing of the orthopterous insect upon which the genus and species are founded, was found in Plant bed No. 2 of the Cordaite shales of the Lower Devonian series at Lancaster, N.B., where Prof. Hartt discovered *Xenoneura antiquorum* years ago. It goes under the name of *Geroneura Wilsoni*. The grub is described as *Archæoscolex corneus*, and is "the first example of the body of an insect recognised among the Devonian shales at St. John." *Eurypterella ornata* is the name applied to a supposed crustacean of small size from the same beds as *Geroneura Wilsoni*, and was found by Mr. W. J. Wilson, who collected nearly all the material from which the above species were described and figured.

The following is a *resumé* of the species described:—

SILURIAN.

DEVONIAN.

- | | |
|--|---|
| 1. <i>Diplaspis Acadica</i> (Matthew). | 1. <i>Geroneura Wilsoni</i> , N. sp. |
| 2. <i>Ceratiocaris pusillus</i> , N. sp. | 2. <i>Archæoscolex corneus</i> , N. sp. |
| 3. <i>Bunodella horrida</i> , N. sp. | 3. <i>Eurypterella ornata</i> , N. sp. |

H. M. A.

ILLUSTRATIONS OF THE FOSSIL FISHES OF THE DEVONIAN ROCKS OF CANADA; Part II. By J. F. Whiteaves. Trans. Roy. Soc. Can., Vol. VI, pp. 77-96; plates V-X.

This admirable paper is a continuation of a previous contribution by the same author to the Transactions of the Royal Society of Canada,

Vol. 4, p. 101, in which *Bothriolepis Canadensis* (Whiteaves), *Acanthodes Mitchelli*? (Egerton), *Acanthodes concinnus* (Whiteaves), and *Phaneropleuron curtum* (Whiteaves) are described, either for the first time or more in full than in the original papers which announced the important discovery of fishes in rocks of Devonian age, in part the equivalents of the Old Red Sandstone of Scotland, from which Hugh Miller's celebrated collections were obtained, and which the famous Louis Agassiz described in his "*Poissons Fossiles du Vieux Grès Rouge*."

In the last volume of the Transactions of the Royal Society of Canada, Mr. Whiteaves describes the remaining species of Upper and Lower Devonian fish-remains which had been collected by Mr. Foord, Dr. Ells, and other officers of the Geological Survey Staff, in the Baie des Chaleurs region. The paper contains descriptions and illustrations of five species "from the Upper Devonian Rocks of Scaumenac Bay, P. Q.," together with a note on *Bothriolepis Canadensis* (Whiteaves), besides "Descriptions of Species from the Lower Devonian Rocks of Campbellton, N. B.," which include descriptions and figures of four species.

In the first part of the paper the following forms are described :—*Glyptolepis Quebecensis*, N. sp., *Eusthenopteron Foordi* (Whiteaves), *Cheirolepis Canadensis* (Whiteaves), *Bothriolepis Canadensis* (Whiteaves, note), *Acanthodes affinis*, N. sp., *Phaneropleuron curtum* (Whiteaves).

Each species receives its full share of careful examination ; details of description are given so that any observer may easily recognise the species in question. Of *Eusthenopteron Foordi* a very exhaustive diagnosis is furnished, in which quite an array of new facts are recorded for the first time.

The second part of this paper includes descriptions of the following forms :—*Cephalaspis Campbelltonensis* (Whiteaves), *Coccosteus Acadicus* (Whiteaves), *Ctenacanthus latispinosus* (Whiteaves), *Homocanthus gracilis*, N. sp. They occur associated with intrusive rocks occurring at the base of the Devonian of that region.

Most of the illustrations were drawn by Mr. Lawrence M. Lambe, artist to the survey, who also helped in a study of the several forms under consideration. These two parts (Parts I and II) of "Illustrations

of the Fossil Fishes of the Devonian Rocks of Canada" are amongst the most important contributions to Canadian Palæontology ever published.

H. M. A.

NOTES ON THE PALEOZOIC BIVALVED ENTOMOSTRACA.—No. XXVII. ON SOME NORTH AMERICAN (CANADIAN) SPECIES. By Prof. T. Rupert Jones, F.R.S., F.G.S.

No. XVII of the Annals and Magazine of Natural History, for May, 1889, pp. 373-387, contains an interesting contribution to the knowledge of some critical forms of Canadian Primitian and Beyrichian Ostracoda, which were sent to Dr. Jones by Mr. Whiteaves, of the Geological Survey of Canada, for examination and study. The species therein described were collected: 1. From the Lower Devonian of Campbellton, New Brunswick, associated with *Caccosteus Acadicus* (Whiteaves) and *Cephalaspis Campbelltonensis* (Whiteaves), etc; 2. from the Lower Helderberg (Ludlow) formation of Cape Bon Ami, New Brunswick; and 3. from St. Andrews, Manitoba.

Devonian—From Campbellton Prof. Jones recognizes his *Primitia mundula* and several of its varieties, which have been heretofore described in previous numbers of the "Annals, etc.," whilst he finds a new species, viz.: *Primitia scaphoides*, which is compared to *P. semicordata* (Jones).

Silurian—From the Lower Helderberg formation of Cape Bon Ami the following forms are recognized, viz.: *Primitia mundula* (Jones), var.; *P. æqualis* (Jones and Holl), Young form.; *Beyrichia Klædeni* (McCoy), var. *Acadica*, N. var. (Jones), along with *Beyrichia arcuata* (Bean) and *Isophilina labron*, N. sp.

Cambro-Silurian or Ordovician—The Manitoba specimen is described by Dr. Jones under the name of *Aparchites Whiteavesii*, *Aparchites* being "a generic group separable from *Primitia* (though there are some passage forms)."

Two lithographic plates accompany the text. It would be a decided advantage if the figures were magnified in all cases a uniform number of diameters. There are besides these figures six woodcuts which are very instructive.

H. M. A.

REPORT OF OBSERVATION OF INJURIOUS INSECTS AND COMMON FARM
PESTS DURING THE YEAR 1888, BY MISS ELEANOR A. ORMEROD.
F. R. Met. Soc., Etc.

The Twelfth Annual Report of our esteemed corresponding member, Miss Ormerod, has just come to hand, and is of great interest and utility not only to English readers, for whom it is specially prepared, but also for enlightened people in all parts of the world. The same general principles underlie the methods of prevention and remedy, for the injuries done to crops by insects wherever they may occur, and the practical common sense shown by Miss Ormerod in the careful discussion and treatment of the different attacks mentioned in the present report, added to the experience she has gained after years of constant study in a special line, should demand the recognition of the talented authoress as a public benefactor by the thoughtless millions who daily benefit from her labours in low prices for many of the necessities of life. Ten per cent is a very low estimate of the amount of annual injury done to farm crops by insects, and this frequently runs up to 15, 25, or even 50 per cent. Of this large amount of loss, by far the greater part could be saved if our farmers and gardeners would only read such reports as Miss Ormerod has given us. Nothing can be truer than what she says so feelingly in her preface. "In a country such as this it appears an evil crying for removal that the *ignorance of the uneducated* should be allowed to cause, year by year, such a demonstrable loss to the nation." The attacks, mentioned in the report include, amongst others, the following orchard pests, which were very numerous in England during 1888. Apple Weevil, *Anthonomus pomorum*, Curtis. Green "Leaf" Weevil, *Phyllobius maculicornis*, Germ. Winter Moth, *Cheimatobia brumata*, L. Lackey Moth, *Clisiocampa neustria*, Curtis. Small Erminie Moth, *Yponomeuta padella*, Linn. Figure-of-8 Moth, *Diloba ceruleocephala*, Linn. Mottled Umber Moth, *Hybernia defoliaria*, Linn. A noticeable fact in the remedies proposed is that there is no mention of the arsenical poisons which are of such inestimable service in our large North American orchards, and which, with ordinary care, can be used with perfect safety. The attack of the Hessian fly on wheat, concerning which there was so much anxiety in England in 1887, seems to have decreased in a marked degree, and this

is doubtless owing to the attention paid by wheat growers to the advice given by Miss Ormerod.

Another satisfactory result of her labours is the decrease in the injury done by the ox warble fly ; it is stated that " warble prevention has advanced much during the last season, and it is still more clearly shown than before that where the maggots are destroyed (as may easily be done) the attack may be for all practical purposes stamped out."

Injuries to beans, carrots, parsnips, and growing grain are also discussed. A new attack of particular interest, of which some particulars are given, is that of the wheat-flour moth. The importance of fighting it vigorously, however, seems to be appreciated, and we therefore trust that it will soon be got within control.

A special chapter upon the "sparrow nuisance" gives more facts to show the absurdity of the claims of those advocates who still try to uphold this pest on the plea that it is an insect-feeder.

J. F.

NOTES AND DESCRIPTIONS OF A FEW INJURIOUS FARM AND FRUIT
INSECTS OF SOUTH AFRICA, BY MISS ELEANOR A. ORMEROD.
F. R. Met. Soc., Etc.

This small 8vo. volume will, we believe, be of great value to the South African colonies. Considerable work has already been done there in economic entomology, but the publication of this work will undoubtedly give a special impulse to this branch of agriculture, which will be of lasting effect. In her modest preface the authoress speaks of it as "merely a fragment," but some of the monographs are very full, and the work is beautifully illustrated with clean figures.

J. F.

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EDITORIAL NOTES.

A letter has been received from Prof. Macoun, who, with his assistant Mr. J. M. Macoun, is still in British Columbia, energetically working up the botany and zoology of the southern portion of that Province. The letter is dated at Kamloops, on 16th June, and states that they have been very successful in collecting specimens, having, at the

time of writing, secured over three hundred skins of birds and other animals, representing one hundred and twelve species, besides a large number of plants and entomological specimens.

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The next general excursion of the Club will be held on Thursday, 8th August, to the "Ox-bow" on the Nation River, near Casselman, on the invitation of Messrs. Wm. Craig and W. J. Summerby, two of our members who reside in the County of Russell. The place is one which should well repay a visit, and it is hoped that a large number of the members will avail themselves of the chance to become acquainted with a locality not before visited by the Club. Those so inclined will have an opportunity of exploring the spot where many interesting Indian relics have been and no doubt still are to be found, as it is within three miles of our stopping place, and the whole day will be at our disposal. Arrangements have been made with the Canada Atlantic Railway to let the excursionists off at the "Ox-bow," thus saving the walk from Casselman. Train leaves Elgin Street Station at 8 a.m., and returning, arrives at 8.30 p.m. Return fare, 75 cents.

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ERRATA.—The following names were, by an accident on the part of the printer, omitted from the list of members published in the last number of *THE NATURALIST*, and the omission unfortunately escaped notice:—C. E. Chubbock; John Hodgins; George Holland; Miss L. von Jantsch; Miss Ruby Rothwell; and T. W. E. Sowter. The editor tenders his apologies to these members for the oversight.

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NEW MEMBERS.—The following new members have been elected since the list of members for this year was published:—T. J. Alnwick; Robert Bell, M.D., LL.D.; Arthur Boulton; J. Carstairs; Rev. Charles S. Deepprose; W. F. Ferrier, B. App. Sc.; G. S. Macdonald; J. J. McNulty; F. Nelson, B.A.; J. M. Oxley; F. X. R. Saucier; C. W. Treadwell; J. G. Whyte.

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EDITORIAL.

Collecting in most of the branches of Natural History has now come to an end for the season. The naturalist, however, must never rest on his oars. There is much to do even now. The collections of the past season have to be sorted out and arranged, new discoveries or rare species must be put aside for description or for exhibition at the winter soirees. This, too, is a branch of our work which is much neglected by members. There is always time at the evening meetings for a short chat before or after the lectures, and if workers in different branches of natural history would each time bring a few of their remarkable captures for exhibition and discussion at the soirees it would add largely to the interest and would certainly cause these agreeable reunions to be better attended.

There are very few cities which equal Ottawa in the advantages which it offers for scientific study and relaxation. The Geological and Natural History Survey, with its grand museum and large staff of active naturalists, of course first demands mention. The museums of the Department of Fisheries, the Ottawa Literary and Scientific Society and the Normal School, as well as the various private collections of our own members, render it unnecessary, in most lines of study, for the beginner to be hampered by the great trouble and expense of sending his material away for identification. Besides the above advantages, there are opportunities right through the winter, at least once a week, of hearing lectures upon scientific subjects. The programme of the Club Lectures is presented herewith, and I think most will agree that it is one of the best programmes we have ever had offered to us. In addition to our own lectures, which will of course be published in the *NATURALIST*, I purpose recording during the present winter the proceedings of the Ottawa Literary and Scientific Society. In the present number will be found Mr. H. B. Small's excellent address as President for the current year, which I feel sure will be read with pleasure by all of our subscribers.

The Treasurer begs to request those members who have not already paid their subscriptions to do so as soon as conveniently possible. The subscription is necessarily payable in advance so as to meet the ex-

penses of publication and postage, which have to be paid promptly at the time of issue of each number of the OTTAWA NATURALIST. The annual subscription of \$1 is fixed at that low figure on the estimate that all will pay up before the end of the year. There is no wish on the part of the Council to have a balance in hand, and if by obtaining a larger number of members more money comes into the treasury, the policy of the past will be followed of enlarging the magazine and lowering the price of the excursion tickets, so as to give the members as much as possible for their money. If members will be good enough to send their subscriptions to the treasurer, instead of waiting until an application is made, they will save that officer much trouble and the club the expense of postage.

JAMES FLETCHER, *Editor*.

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The thirty-eighth annual meeting of this flourishing association was held in Toronto, beginning on 27th August and lasting for a week. The meeting was an unqualified success. The Toronto people outdid themselves in hospitality to their visitors, who went home enthusiastic in their praises of the courtesies extended to them. Many valuable papers were read in the various sections and clubs. It is pleasing to notice that Canadians did their share to make the meetings interesting. The Botanical and Entomological Clubs held regular meetings in the new biological laboratory of Toronto University. Perhaps one of the most interesting lectures was a demonstration by Prof. Ramsay Wright of his method of teaching natural science.

As an outcome of the meetings and discussions of the Entomological Club, a permanent association or union was formed for the special consideration of economic and agricultural entomology. This organization, which will be known as the Association of Official Economic Entomologists, will meet annually, and the discussions will be confined entirely to the operations of injurious and beneficial insects. The officers for the year are as follows: President, Prof. C. V. Riley, United States Entomologist; Vice President, Prof. S. A. Forbes, State Entomologist of Illinois; Secretary, Prof. J. B. Smith, Entomologist of the New Jersey Agricultural Experiment Station. The first meeting of this association was held at Washington, on 12th Nov., and the proceedings are to be published in the next number of *Insect Life*.

Ottawa Field Naturalists' Club

PROGRAMME

For the Winter of 1889-1890.

SOIREEs:

1889.

Dec. 13.—Inaugural Address, (Geological Progress in Canada.) Dr. Ells.
1890.

Jan. 10.—The Mistassini Region.....Mr. A. P. Low.
The Serpentine of Canada.....Mr. N. J. Giroux.

Jan. 24.—The Yukon Country Mr. McConnell.
Glaciation in America.....Dr. A. C. Lawson.

Feb. 7.—Some Geological facts observed on a trip to the
Straits of Belleisle.....Dr. Selwyn.

A Bird in the Bush Mr. W. A. D. Lees.

21.—Some notes on the English Sparrow.....Mr. J. Ballantyne.
The Wolf.....Mr. Lett.

Mar. 7.—On some of the larger unexplored portions of
Canada.....Dr. G. M. Dawson.

A Naturalist in the Gold Range, B.C....Mr. J. M. Macoun.

13.—Reports of the Leaders of Branches.

MONDAY AFTERNOON POPULAR LECTURES.

Jan. 13.—Geology (Volcanoes and their associated phenomena).....Dr. Ells.

20.—Palæontology.....Mr. W. R. Billings.

27.—Botany.....Mr. W. Scott.

Feb. 3.—Botany.....Mr. J. M. Macoun.

10.—Zoology.....Mr. J. Ballantyne.

17.—Ornithology.....{

24.—Ornithology.....{ Mr. W. A. D. Lees.

Mar. 3.—Entomology.....Mr. T. J. McLaughlin.

10.—Conchology.....Rev. G. W. Taylor.

THE LAND SHELLS OF VANCOUVER ISLAND.

BY REV. GEO. W. TAYLOR.

Very little attention seems to have been given by conchologists to the land and fresh water shells of the extreme western portion of the Dominion. Many very full lists of eastern Canadian shells, and others more or less complete, of the mollusca of the prairie provinces, have been published; but, so far as I know, only one person (Mr. J. K. Lord) has attempted to enumerate the land shells of our Pacific coast, and his list, published in "The Naturalist in Vancouver Island," 1866, is very incomplete, containing the names of seven species only.

My own collecting in Vancouver Island, although it has extended over a period of seven years, has not been by any means exhaustive. In fact I have only examined four localities, and these comparatively near together, and all on the east coast of the island:—

1. Victoria, at the south-eastern extremity of the island;
2. Saanich, twenty miles north of Victoria;
3. Salt Spring Island, a small island about a mile from the coast of Vancouver Island and a little to the north of Saanich;
4. Comox, a settlement about 140 miles north of Victoria, but also on the east coast of Vancouver Island.

In these four localities, however, I have succeeded in finding thirty species of terrestrial mollusca, which form the subject of the present paper, and twenty-six species of fresh water shells, which I propose to enumerate in a subsequent contribution to this journal.

The list of Vancouver Island land shells that here follows contains the names of thirty-two species; thirty of these, as above stated, have been taken by myself. Of the other two, one, *Onchidella Carpenteri*, W.G.B., is added on the authority of Dr. W. G. Binney, and might probably have been found by me had my search been more thorough. The other, *Arionta Dupetithouarsi*, is recorded from Vancouver Island by J. K. Lord, but my own impression is that the shell was collected in California and accidentally mixed with the Vancouver collection, as no trace of this species has been discovered on the island by anyone

else. Mr. Lord also took home to England a specimen of *Orthalicus zebra*, a Central American shell which he said he had taken alive on Vancouver Island. I have seen the specimen itself in the British Museum, but I cannot think that the species is indigenous on Vancouver Island.

LAND SHELLS OF VANCOUVER ISLAND.

1. *Selenites Vancouverensis*, Lea, sp.
2. " *sportella*, Gould, sp.
3. *Limax agrestis*, Linn.
4. " *hyperboreus*, Westerlund.
5. *Hyalina arborea*, Say, sp.
6. " *milium*, Morse, sp.
7. " *Binneyana*, Morse.
8. " *conspecta*, Bland, sp.
9. *Conulus fulvus*, Müller, sp.
10. *Vitrina Pfeifferi*, Newcomb.
11. *Patula striatella*, Anthony, sp.
12. " *asteriscus*, Morse, sp.
13. *Microphysa Lansingi*, Bland, sp.
14. " *Stearnsii*, Bland, sp.
15. " *minutissima*, Lea, sp.
16. *Ariolimax Columbianus*, Gould, sp.
17. *Prophysaon Hemphilli*, Bland and Binney.
18. *Stenotrema germanum*, Gould, sp.
19. *Mesodon Columbianus*, Lea, sp.
20. " *devius*, Gould, sp.
21. *Aglaja fidelis*, Gray, sp.
22. *Arionta Dupetithouarsi*, Deshayes, sp.
23. *Pupilla corpulenta*, Morse, sp.

24. *Vertigo ovata*, Say.
25. " *simplex*, Gould, sp.
26. *Ferussacia subcylindrica*, Linn. sp.
27. *Succinea rusticana*, Gould.
28. " *Nuttalliana*, Lea.
29. " *Oregonensis*, Lea.
30. *Onchidella Carpenteri*, W. G. Binney.
31. " *borealis*, Dall.
32. *Carychium exiguum*, Say, sp.

In the foregoing list several species will be recognized as common European forms, namely, *Limax agrestis*, *Conulus fulcus*, *Ferussacia subcylindrica*, and in the opinion of some conchologists the following American and European species are also identical :—

AMERICAN.		EUROPEAN.
<i>Microphysa minutissima</i> , Lea,	=	<i>pygmaea</i> , Drap.
<i>Vertigo ovata</i> , Say,	=	<i>antivertigo</i> , Drap.
" <i>simplex</i> , Say,	=	<i>edentula</i> , Drap.
<i>Carychium exiguum</i> , Say,	=	<i>minimum</i> , Müll.

As, however, there is a little uncertainty on these points, I prefer for the present to use the earliest American names.

The seven species just mentioned occur also in the eastern parts of Canada, and with the five following find a place in the Ottawa lists : *Hyalina arborea*, *Hyalina milium*, *Hyalina Binneyana*, *Patula striatella*, *Patula asteriscus*. There are thus twelve species out of thirty-two common to Ottawa and Vancouver Island. The remaining twenty species are all purely western forms, with the single exception of *Papilla corpulenta*, which is recorded from Nevada and Colorado.

NOTES.

1. *SELENITES VANCOUVERENSIS*, Lea, sp.

Helix Vancouverensis, Lea. Am. Phil. Trans., VI, 87, pl. xxiii, f. 72 (1839) = *H. vellicata*, Forbes.

Common and distributed over the whole island. When fully adult the peristome is sometimes almost as much depressed above as in *sportella*.

2. *SELENITES SPORTELLA*, Gould, sp.

Helix sportella, Gould, Proc. Bost. Soc. Nat. Hist., ii, 167. (1846)

Occurring with the last species at Saanich, Comox and Salt Spring Island, but absent from the district round Victoria. As regards its shell it seems abundantly distinct from *Vancouverensis*; at any rate it is a well marked form, and as such deserves a name. It differs from the last species in being constantly smaller and more strongly striated, and in having a much more open umbilicus. The dimensions of this species and of *S. Voyana*, as given in Binney's Manual, seem to be incorrectly printed.

3. *LIMAX AGRESTIS*, Linné, Syst. Nat. ed. x, I, 652 (1758).

Introduced, I suppose from Europe, a few years ago, and now a great pest in the Victorian gardens. It has not yet spread far into the country districts, but no doubt such extension is only a matter of time.

4. *LIMAX HYPERBOREUS*, Westerlund.

I collected some small blackish slugs at Comox in May, 1887, of which I sent some specimens to Dr. W. G. Binney. He referred them doubtfully to this species. In his "Second Supplement to the 5th volume of the Air-breathing Mollusks of the United States," p. 42, Dr. Binney mentions the receipt of a *Limax* from Seattle, Washington Territory, similar to *hyperboreus* in outward appearance and in the dentition.

5. *HYALINA ARBOREA*, Say, sp.

Helix arborea, Say, Mich. Encyc., pl. iv, fig. 4. (1816).

Very common everywhere. Cannot be distinguished from eastern specimens.

6. *HYALINA MILIUM*, Morse, sp.

Helix milium, Morse, Proc. Bost. Soc. VII, 28, (1859).

Not rare among fallen leaves and moss.

7. *HYALINA BINNEYANA*, Morse, Journ. Portl. N. H. Soc., I, 13, fig. 25, 26; and pl. ii, fig. 9; pl. vi, fig. 27. (1864).

Not common. I am not very confident that this is the true *Binneyana*. Specimens collected by me have been seen by Dr. Binney, who considered them to be *H. viridula*, and has so recorded them in Bull. Mus. Comp. Zool. Cambridge, vol. XIII, p. 42. Dr. Dall, however, named other specimens from the same lot *Binneyana* after comparison with typical specimens in the Smithsonian collection. My shells are very different in colour to those I have always received as *viridula*, and neither do they agree exactly with Binney's figure of *Binneyana*, though they are more like the shells that receive the latter name in Ottawa collections. It is just possible that the Vancouver shells may belong to a distinct species.

8. *HYALINA CONSPECTA*, Bland, sp.

Helix conspecta, Bland, Ann. N. Y. Lyc, VII, 163, fig. 7. (Nov. 1865).

Alaska to California. Next to *striatella* and *arborea* this is the commonest of the smaller land shells in Vancouver Island. It occurs everywhere under logs and stones and among decaying leaves.

9. *CONULUS FULVUS*, Müller, sp.

Helix fulva, Müll. Verm. Hist., pt. II, p. 56. (1774) = *H. chersina*, Say, + *H. egea*, Say.

Circumpolar. Common. The specimens I have collected in Vancouver Island are the finest I have seen; larger than any I have taken in England or in Eastern Canada.

10. VITRINA PFEIFFERI, Newcomb, Proc. Cal Acad. Nat. Sci., II, 92. (1861)

Not common, but widely distributed. Occurs usually under stones. I have never found it in colonies like *limpida*.

11. PATULA STRIATELLA, Anthony, sp.

Helix striatella, Anth. Bost. Jour. Nat. Hist., III, 278, pl. iii, f. 2. (1840)

Very common.

12. PATULA ASTERISCUS, Morse, sp.

Helix asteriscus, Morse Proc. Bost. Soc. Nat. Hist., VI, 128. (1857).

Not rare at Comox, May 1887, among fallen and decaying leaves. I have not found it elsewhere on Vancouver Island. Occurs also in eastern parts of America.

13. MICROPHYSA LANSINGI, Bland, sp.

Zonites Lansingi, Bland, Ann. Lyc. N. H. of N. Y., XI, 74, fig. 1, 2. (1875).

Described from Astoria in Oregon. It is not uncommon in Vancouver Island, and I have found it in all the localities I have examined. At Comox and Salt Spring Island, however, the next species is the more plentiful.

14. MICROPHYSA STEARNSI, Bland, sp.

Zonites Stearnsi, Bland, Ann. Lyc. N. H. of N. Y., XI, 76, fig. 3. (1875)

This rare shell can easily be distinguished from *Lansingi* by its larger size, darker color, and the absence of the lamella on the peristome. I have only found it at Comox and

Salt Spring Island, where it occurs not uncommonly with *Lansingi* under leaves and under pieces of maple bark in the woods. This species was first found in Oregon and Washington Territory.

15. MICROPHYSA MINUTISSIMA, Lea, sp.

Helix Minutissima, Lea, Trans. Am. Phil. Soc. IX, 17. (1841)

? = *Helix pygmaea*, Drap. Tab. Moll. p. 93. (1801)

Common under dead leaves in woods. There seems still to be a doubt as to the identity of this species with the European *H. pygmaea*, Drap. My Vancouver Island specimens do not appear to me to agree well with those I have collected in England.

16. ARIOLIMAX COLUMBIANUS, Gould, sp.

Limax Columbianus, Gould, in Terr. Moll., II, 43, pl. lxvi, fig. 1. (1851).

Pacific Coast, British Columbia, to California. Common, growing to a very large size. Around Victoria the specimens are generally spotted and blotched with black, but at Comox the unicolorous variety is more common. The eggs of this species, which are as large as good sized peas, are often found under logs or bark during the winter.

17. PROPHYSAON HEMPHILLI, Bland and Binney, Ann. Lyc. N. H. of N. Y., X, 293, pl. xiii, fig. 8. (1873)

The commonest slug in Vancouver Island and recognized at once by the two blackish lines that border the mantle. It may be found under logs and stones and among leaves all over the island. It also occurs in Oregon and California.

18. STENOTREMA GERMANUM, Gould, sp.

Helix germana, Gould, U. S. Expl. Exped. Moll., (1852), p. 70, fig. 40, a, b, c.

Not common, but occurring in all the localities I have searched.

It is a much smaller shell than the next species, and is of a richer chestnut color. Specimens usually occur singly, and I have never found more than two under the same log. *Columbianus*, on the contrary, is generally in colonies. *Germanum* seems to be a species of limited range, the only locality named in "Binney's Manual" being Astoria, in Oregon.

19. *MESODON COLUMBIANUS*, Lea, Sp.

Helix Columbiana, Lea, Am. Phil. Soc. Trans., VI, 89, pl. xxxiii. fig. 75.

= *H. labiosa*, Gould.

Abundant among leaves and under logs. Occasionally specimens occur with an indication of a parietal tooth. I have twice taken specimens with the shell of a grayish white colour. Occurs from Sitka to California.

20. *MESODON DEVIUS*, Gould, sp.

Helix devia, Gould, Proc. Bost. Soc. N. H., II, 165. (1846)

I have only seen one specimen of this species from Vancouver Island, and that was taken at Esquimalt, near Victoria. The specimen was sent to Dr. W. G. Binney, who agreed in the identification. *Devius* is not uncommon in Oregon, and was therefore to be expected in Vancouver Island.

21. *AGLAJA FIDELIS*, Gray, sp.

Helix fidelis, Gray, Proc. Zool. Soc., July, 1834, 67.

= *H. Nuttalliana*, Lea.

Common in woods. The shell sometimes nearly black, occasionally very pale greenish white and almost transparent. This species roams abroad in wet weather in the spring and autumn after the manner of the European *Helices*.

22. *ARIONTA DUPETITHOUARSI*, Deshayes, sp.

Helix Dupetithouarsi, Desh. Rev. Zool., 1839, 360.

= *H. Oregonensis*, Lea.

This species is entered here simply on the strength of the record by Lord mentioned above. I have not myself seen in Vancouver Island any trace of this shell, or indeed of any other *Arionta*. *Arionto Townsendiana*, Lea, sp., is, however, common on the mainland of British Columbia, but has not as yet turned up on the island. *Dupetithouarsi* is a native of Monterey, California, and a few other places in the same region.

23. PUPILLA CORPULENTA, Morse, sp.

Isthmia corpulenta, Morse, Ann. N. Y. Lyc., VIII, 210, fig. 7 (Nov. 1865).

Not rare in moss and among leaves. Also found in company with *Vertigo simplex*, as described below. This is a species that was hardly to be expected in Vancouver Island, its headquarters being in Nevada and Colorado, but I believe my specimens are correctly determined.

24. VERTIGO OVATA, Say, Journ. Acad. Nat. Sci. Phil., II, 375. (1822).

+ *Pupa modesta*, Say.

= *V. tridentata*, Wolf.

Only taken in one locality near Victoria. This was on the margin of a swamp (since drained) about four miles from the city. The specimens were under leaves close to the water's edge. It is an eastern species not before quoted from the Pacific province. Dr. Gwyn Jeffreys considered this species identical with the British *Vertigo antivertigo*, Drap.

25. VERTIGO SIMPLEX, Gould, sp.

Pupa simplex, Gould, Bost. Journ. Nat. Hist., III, 403, pl. iii, fig. 21 (1840).

I have found this species in moss in many localities, but not plentifully. In May, 1887, however, I found it, together with *Papa corpulenta*, in great abundance on the fronds of a fern, *Aspidium munitum*. This was at Comox, but I afterwards found it in the same situation in other localities. The *Aspidium*

grows most luxuriantly in damp places all over the island, and few plants that I have examined at the right season of the year have been without one or more of the Vertigos. This species is referred by Jeffreys to *Vertigo edentula*, Drap., of Europe.

26. FERUSSACIA SUBCYLINDRICA, Linn., sp.

Helix subcylindrica, Linn. Syst. Nat. ed. 12, II, 1248. (1766)

= *lubrica*, Müller.

= *lubricoides*, Stimpson.

= *Morseana*, Doherty.

This widely distributed species occurs, but not very abundantly, in all the localities I have examined, generally under stones or logs, often in very exposed situations.

27. SUCCINEA RUSTICANA, Gould, Proc. Bost. Soc. N. H., II, 187. (Dec. 1846).

The three species of *Succinea* here recorded seem to be distinct, although it is not easy, to my mind, to distinguish between the young specimens. *Rusticana* has only occurred to me at Comox.

28. SUCCINEA NUTTALLIANA, Lea, Proc. Am. Phil. Soc., II, 32. (1841).
Common at Victoria.

29. SUCCINEA OREGONENSIS, Lea, Proc. Am. Phil. Soc., II, 32. (1841).
Common at Victoria. These three Succineas occur throughout the "Pacific province."

30. ONCHIDELLA BOREALIS, Dall, Am. Journ. Conch., VII, 135. (August, 1866).

This species is common near Victoria on rocks close to high water mark, but is very likely to escape notice unless specially sought for. It was found by Dall from Alaska to Vancouver Island.

31. *ONCHIDELLA CARPENTERI*, W. G. Binney, Proc. Ac. Nat. Sci., Phil., 1860, 154.

Not taken by myself, but said by Binney to occur from Straits of Fuca to Gulf of California. As nearly all the mollusca recorded from the Straits of Fuca have also been found on the Vancouver coasts, it is most probable that this also occurs there. It is much smaller than *O. borealis*, and hence may have escaped my notice.

32. *CARYCHIUM EXIGUUM*, Say, sp.

Pupa exigua, Say, Journ. Acad. Nat. Sci., II, 375. (1822).

! = *C. minimum*, Müll. Verm. Hist. pt. II, p. 125. (1774).

Common at Comox and Salt Spring Island, but not observed near Victoria.

DEVELOPMENT AND PROGRESS.

(AN INAUGURAL ADDRESS DELIVERED BY MR. H. B. SMALL, PRESIDENT OF THE OTTAWA SCIENTIFIC AND LITERARY SOCIETY, 14TH NOVEMBER, 1889.)

The above was the subject of a comprehensive paper showing the rapid strides development and progress have made in science and literature during the latter part of the nineteenth century.

After reviewing various matters in connection therewith, the lecturer based the existence of everything that caused development on the use of the solar power either directly or indirectly, and the existence of this he traced through the various channels conveying it.

The following extracts afford to our readers the main portions of the lecture :

Applied science is built upon the long and unrequited labor of students. The steamship, the railway, the telegraph, the telephone and nearly every invention of the age, are due to the patient observation and collection of facts which at one time appeared to have no practical bearing. It is perhaps difficult to get even a misty glimpse of the practical utility of some investigations, such as those in archæology and philology, but the fascinating interest of some of the conclusions arrived at, or to be reached, have at least a value in developing the human mind which money cannot measure. We are apparently on the eve of startling discoveries in astronomy which it is easily conceivable may have a bearing on material affairs. This is true in a far greater measure of meteorology, geology and chemistry, in all of which the data accumulated are great, and the problems awaiting solution are of an intensely practical nature. Physiology and its kindred sciences have not only in recent years added to the fairy tales of science, but have opened new fields of great promise and consequence. Intensely interesting, and suggestive of great results to the human race, are the recent discoveries in regard to cell-life. The anatomy and physiology of these cells, spores and bacilli have already received sufficient attention to warrant the hope that improved methods of prolonging life and warding off disease may yet be discovered. Great as have been the advances of late years, we are apparently waiting for discoveries and inventions quite as great,

and we have to look for them very largely as the result of investigation and patient collection of dry data which do not appeal to popular fancy. There is, therefore, good reason why the increasing number of people among the general public who appreciate the results of pure science should give what encouragement they can to scientific institutions and societies.

Facts need to be ascertained. We are too apt to confine ourselves to matters of importance of to-day, without regard to their bearing on the future, when their commercial bearing may be most marked. The scientific results of specialists should be discussed by men of general knowledge or science, before they can become available to all. One of the most remarkable signs of progress and development during the last half century is to be found in the growth of the colonies and dependencies of the Crown. The opening era of the Australian continent, and of the foundation of our own Dominion, now spanning this continent, are two of the brightest spots in this career of progress. These developments of her resources have not cost England battles by land or by sea, nor have they added millions to her national debt. What we trace is a period of sunshine, prosperity and progress. New communities devising for themselves institutions, now sub-dividing for convenience, now confederating for mutual help, and all under one benignant sceptre. The state of things is not yet definite, but time is granted to devise even a firmer system, a federation of the whole. Could we lift the curtain that covers the destiny of the next century, who could foretell the aspect? The word "Excelsior" would stand out prominent, blazoned in letters of gold.

Man's circumstances under the influence of man's mind tend to progress. By the extension of railways, industrial conditions everywhere are undergoing changes; manufacturing towns need no longer be located on rivers or by the sea, but may be established near the sources where the raw materials for manufacture are obtained. The development of the world's resources is facilitated by the application of various departments of science, such as mining, farming, fishing, engineering, and navigation; and supply and demand, and the changes which are always in progress can be anticipated by such commercial men as undertake to acquaint themselves with the leading principles of physical geography.

In point of utility, and as a vast reservoir of power, coal takes the lead amongst minerals which aid development. Its energy is a fraction of the solar heat and light diffused on the tree ferns and giant tropical growth of the carboniferous era, ages before man, which is again partly restored in combustion. Wherever coal exists, there is, or will be, development, and to its presence is due the existence of many a great industrial town. Take the Lowlands of Scotland and the manufacturing districts of England for an example. France, Belgium and part of Germany are hives of industry overlying coal fields, and a network of railways binding them together, aids in developing manufactures of all kinds, with ever increasing success.

The coal deposits of America, and their associated iron, have covered the Eastern States with factories and railways, and yet the story is told, that scarce one hundred years have elapsed since a wandering hunter in Pennsylvania built a fireplace of stones in a lonely valley, and was astonished to see his hearth taking fire from the burning brushwood. That was the first discovery of the great Appalachian coal field, and, if I mistake not, our own fellow-townsmen, Professor Macoun, in his wandering over the prairies in search of his favorite plants, near Crowfoot, accidentally found, much in the same way, what are now the coal mines of the Saskatchewan district in our Northwest. As long as coal maintains the preëminence as the source of power, the nations owning coal regions must maintain a supremacy. As in the course of centuries the supply fails in the countries now producing it, so the seat of commerce will change to where coal has yet been undeveloped, and the land of the Celestials (China), whose coal deposits are said even to cast America into the shade, will and must become the centre of commerce. Then civilization will have traversed the globe to recommence in the East.

Petroleum, accidentally discovered whilst boring for brine, to the intense disgust of the borer, has to a wonderful degree developed many large and important towns; but a rival treads hard on its heels, and before liquid fuel has displaced the solid it is itself threatened by gas. Pennsylvania, Ohio and Indiana are using gas where petroleum and coal formerly maintained the sway. Iron is melted, glass manufactured, and steam raised for factories, towns lighted, and houses heated by

the vast supply of natural gas, which has drawn together a rush of population, and factory towns have sprung up at its bidding.

The precious metals and stones are doing their part in developing new countries. California, Australia, British Columbia and the South African republic have in turn been peopled by miners. Towns sprang up, first in canvas, then in wood, till by the exhaustion of surface and unskilled diggings, technical skill and division of labour became necessary; capital became more powerful than labour, companies controlled the mining by machinery, and the town founded in haste either dwindles away, as may be seen at Silver City and at Golden, in our own Rocky Mountains, or else develops the agricultural resources of the region, so that its next generation is transformed into a prosperous farming community. When the first discovery of diamonds was made at Kimberly, South Africa, a few miners' huts sprang up in a desert region; now Kimberly is a town of over 20,000 inhabitants, with a railway from the coast, and with the most approved system of water-works and electric lights. When the diamond supply fails, as eventually it must, the frontier trade will suffice to support there a prosperous town, but no such site would ever have come into existence in so desert a land without being developed by the valuable products of its mines. The country dependent on minerals alone has been likened to a man depending on a liberal expenditure of his capital for prosperity—the more lavishly he spends it the wealthier he seems, but in reality the poorer he becomes.

With plants and animals this is different, and the wealth of a people in live produce corresponds to the interest of a large capital. They have no fixed natural distribution, but can be carried to new regions; by cultivation and breeding, their value and number can be increased.

Timber may be regarded as a typical natural vegetable product, but large supplies of it do not concentrate population except under certain conditions of water-power, etc., and even then, when the supply is exhausted, unless something else takes its place, the town rapidly declines. Even here in our own city, where the business of rafting used to be largely carried on, the development of the forests by railways piercing their midst has diverted or destroyed this business, and the square timber that for years afforded work to hundreds in the rafting

line, is now loaded upon trucks specially prepared to receive it, right in the forest itself, and run down direct to Quebec in three days time, as against three weeks formerly required to float it down in rafts. British Honduras exists as a colony only for its woods ; Burmah was annexed to the British rule for its valuable forests of teak ; and sandal-wood has been the means of opening up many of the islands of the south seas. Cotton, the importance of which can never be overestimated, has had much to do with the social condition of this continent. Its growth developed the southern States, whose climate suited it well ; but requiring harder labour than the planters cared to give, African labour was imported, and the climate suited that race.

Wheat, however, is the great factor of the vegetable world in developing civilization. Climate has much to do with the well-being of this cereal. A hot, dry summer gives it perfection, a changeable and damp summer is detrimental to it. Confined formerly to only certain districts, it is now by adaptation of circumstances grown where a few years ago its cultivation would have been laughed at, and the great wheat fields of India now furnish large supplies, through the extension of railways and by means of irrigation, combined with very low wages. In Australia, the Argentine Republic, Chili and California, wheat is now grown to an enormous extent by means of improved systems of agriculture, and the development of these countries is remarkably increasing.

Look at our great Northwest and the rapid strides of its development. The Canadian Pacific Railway depends largely on wheat as an article of freight traffic, and the lines to the southern frontier from Winnipeg were mainly built for wheat, and as new branches are extended over the prairie, pioneer settlers break up the matted sod that has for centuries turned the rain aside from the soil below, which, soaking into the newly exposed surface, calls forth at once its power of raising grain. What the future of this granary of the world, now throbbing with the strongest and newest life of the west will be, none dare predict. From the height of land south-west of Lake Superior, the whole valley of the Red River northwards to Lake Winnipeg, the undulating prairies rolling westward to the Rocky Mountains, and the Upper Mississippi valley, constitute this granary, and this centre of production is the centre of the river systems of North America. The old

style mill that turned out the flour used by our ancestors is a thing of the past, and the skill and science displayed in the manufacture of that commodity now, has developed the growth of cities like St. Paul and Minneapolis; and Rat Portage bids fair, with its water power to rise to similar eminence.

But continuous cultivation rapidly exhausts the soil, of which Eastern Canada and the Eastern States are a living example, and the materials yearly extracted therefrom, must be returned by fertilizers, or the production fails.

In 1889 Mr. Gordon Brown calculated the amount of phosphorous actually contained in the grain annually shipped from the port of Montreal, estimating it for this purpose in the form of phosphoric acid. The shipment of that year amounted to 292,534 tons, and the quantity of phosphoric acid sent away in it equalled 2,340 tons. Taking the average quantity of this substance contained in good soils, he found this meant an exhaustion to a depth of one foot of 70,320 acres, in so far as phosphates are concerned, and that to restore this 5,850 tons of artificial manure would be required. The total loss of phosphoric acid in the year to Canada, he estimated, represented \$500,000.

This again leads to development. Our new phosphate industry, the product of which is not yet used at home, is in constantly increasing demand abroad, and when its necessity becomes apparent here, such development will take place around the scene of its production that will wake the echoes of the old Laurentian hills, and imagination would not be far astray in picturing at our Chaudiere water-power huge manufacturing establishments for grinding, treating and manipulating this necessary adjunct to wheat growth, long after the present lumber business has removed to points still further away.

Another valuable point about plant life is, that where one species fails, another may succeed. Tea cultivation succeeded the old coffee plantations of Ceylon when they gave out, and the same may be said of fruit culture. Dye plants are now scarcely cultivated, a chemical treatment of coal tar producing to-day most of the dyes of commerce, and the land that yielded these plants is turned to other uses.

As regards animal life, that has had much to do with the civilization of the world. From the days when the patriarchs of old moved

about with their flocks and herds in search of pasture, down to the ranche life of the west to-day, the owners of these cattle were, and are, the pioneers of civilization. The vast pastures of Australia were nibbled by only a few kangaroos, till men saw their suitability for sheep. Australian wool is now the finest produced in the world, and the unusual fecundity of the sheep in that country was most marked. Analogy in this respect to other animals was not thought of, and the rabbit, introduced for sport, has now become such a pest as to threaten the very destruction of the sheep pastures. The above examples fully serve to show how natural commodities exert the chief influence in the growth or origin of centres of population and trade, whilst hundreds of other facts could be cited if needed.

In the development of man, the general aspects of nature and climate exert an appreciable influence. A hot climate and bounteous soil tend to enervate the body and mind, but a temperate clime, where the hand and the head must be constantly at work, is favorable to physical and intellectual development or brain power. The latter is that activity of the mind which shows itself in the great productions—literature, art, architecture, conquest and civilization—and it is interesting to trace the gradual changes from ancient times down, and see that it has been from the gross to the finer idea, and from warmer to colder climates. Egypt, with its civilization running beyond the records of history, gave expression to its brain power in gigantic pyramids, huge sculptures, and the elements only of the arts and sciences. Although the climate was too warm for great mental activity, the extremely dry atmosphere gave the Egyptians of old advantages superior to many of the neighbouring nations. When they ceased to possess princes able to lead them to conquest, or to continue gigantic buildings, the ease with which they could procure a living from their valley soil caused them to fall into habits of indolence, and their enervation was their downfall.

India, with a similar temperature but moister air, produced later on the fantastic civilization, and light, airy and imaginative architecture peculiar to the Hindoo race, its impossible systems of cosmogeny, deities and worship, lived its life of sensual intellectuality and then passed away. Greece, with its more moderate climate, its narrow valleys, rapid streams and snow-capped mountains, with its clear sky, and

soil not so rich as to breed habits of indolence, placed its people where they could achieve prodigies ; and its advanced civilization, arts, laws, architecture, statuary and literature, both poetic, historical and philosophical, were the outcome of these favorable conditions. In Italy, with a climate still nearer perfection, the results were on a vaster scale than in Greece, and culture was broader, especially in law and general knowledge. But when in the Roman Senate there was no longer the cry that " Carthage must be destroyed," when accumulated wealth and luxury had done their deadly work, as they did in Greece, the climate, too warm and humid to invite the Roman character to hard mental labour, allowed the sceptre to depart from Italy, and to be upheld by a sturdier race in a colder clime. In France, where the climate is somewhat colder than Italy, and from its various genial and sunny climatic influences sprung a sparkling and vivacious literature peculiar to its race. But luxury has done its work there, and it is the colder and more northern climate where no extremes occur, and where food is raised eminently fitted to produce a robust physique, and not to pamper the appetite, where intellectual grandeur culminates. England, Ireland and Scotland are proofs of this, and Germany goes hand in hand. The productions of these countries are not so spontaneous as to beget indolence, and reaction of the system against the cold sets the powers of the mind into vigorous action. These northern nations present mental results that live ; facts are reached by induction, imagination is rich and varied, but not wild and sensual, and patient research marks all their literature. On this continent the influences of climate are plain to all. The greyer skies and severer climate of the North control man's character and activities, whilst the Southerner gives himself up more to the indolence engendered by the influences of a hotter atmosphere.

American literature lies in the north, and Canada and the Northern States have produced and are producing the literature and mental energy of the continent. When men are settling a country there is but little chance for mental products. Their minds are absorbed in organizing, building, shaping. Thought is like carbon ; to crystallize into the diamond needs time, and the most favourable of surrounding influences. Yet the very fusion of so many diverse characteristics of blood, locality

and nationality, is an element of future greatness, and time only can develop the latent qualities of the whole when merged into one. History has always shown that when a people can *easily* get a competency or wallow in riches, degeneracy of mind follows. Note Egypt, Persia, Rome.

To the student who has thought out the gradual development of literature, its changes are as full of wonder as are the formation of rocks to the geologist. Early man tried like the child of to-day to draw, and in the rude endeavour scratched with a flint tool on bones found in the caves of Southern France, we may see the beginnings of an art which culminated in the creation of writing. Dr. Isaac Taylor says that "the history of writing forms no exception to that law of developement which modern research has found to preside over the destinies of the universe." Printing has been the great medium of development of literature in modern days. The germ of its discovery was innate; but it took centuries to evolve it, and to attain to the degree of excellence it now possesses. Signet rings and seals and the scarabæi found in Egyptian tombs bore elaborate inscriptions evidently intended to be transferred to the surface of substances fitted to receive them. The dies of coin in all countries involve the same idea. What the intellectual exigencies of future generations may be who can tell? Education is spreading every day, and in every country. A love of knowledge, of science, of literature is penetrating all communities deeper and deeper, and will, in the onward march of civilization, be universal. Doubtless men in the future as in the past will continue to develop contrivances answerable to all needs. Photography and electricity may be enlisted yet further than they have already been in the service of letters, and appliances for satisfying the mental hunger of the human race, having photography and electricity as co-efficients, may possibly be thought of which to us now would seem to involve the incredible, but which to our descendants will be things of course, and classed by them among the ordinary conveniences of every day life. Nothing is now impossible.

Lord Justice Fry not long ago wrote an article in the *Contemporary Review* on the subject of imitation as a factor in human progress. He says "how far the manual and technical arts of human life owe their

suggestion and origin to imitation is a point which has never been fully considered." The first canoe was made in imitation of a rotten log which had served as a ferry boat. The first pillar was constructed in the likeness of an erect tree, and the gothic arch was made to represent the overarching boughs in a forest glade, suggestive of how the imitation of the objects in nature underlies all the various arts and products of human labor. Now the absence of this faculty of imitation would produce a stagnation in human society, because each man and each generation of men would derive no benefit from what their forefathers had learned. The presence of no other principle of life must and does equally produce stagnation. A really healthy and progressive state of society is only consistent with free thought and effort. It is difficult in this nineteenth century to realize a society which is really stationary; with our greedy appetite for new ideas, new things, reforms and improvements. We can scarcely credit that a great part of the human race knows none of these, and feels no such appetite, that it has gone on for centuries in the same way as it goes on to-day, and that it regards any attempt to introduce new thought or new modes of life, not merely as an impertinence but an impiety.

But with all our development and progress, we must be warned by the fate of Egypt, Greece, Rome and all other great nations of the past, lest on reaching the zenith of our fame and prosperity, we relapse into a state of apathy, indifference and luxury, and commit that most fatal error of living on the reputation we have gained and the successes we have achieved. When most obstacles have been overcome, and when the struggle for existence and greatness has been triumphantly concluded, nations are apt to give way to a longing for rest, the accumulation of wealth, and the enjoyment of luxury. Politics and commerce doubtless rule, to a great extent, the destiny of nations, but there are other influences as well, and chief among these are the social conditions of the people. The two great examples of the Roman empire and the French monarchy stand out in history as a warning, the social conditions of the people in both cases being the downfall of each. What facts attest, the people cannot afford to despise, and a timely warning may avert many a danger threatening the public welfare.

The developement of man's immortal condition is not in the province of a secular theme like the present ; that is left for the pulpit and the preacher. It is a branch of this subject that might fill a volume and send joy into minds that are darkened with doubt, but it is too sacred to be lightly dealt with, or simply passed over, as the limits of an occasion like this would permit.

The permanent edifice of the world's education seems to patiently await the time when men shall tire of fashioning useless building stuff from their crumbling theories, and revert to the basal granite of which the everlasting foundations are laid, caring only to shape the superstructure by the Master Architect's plan. The movement of vital energy is man-ward, and the cry of mankind is God-ward. *Excelsior !*

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OXYGEN—ITS ROLE IN NATURE.

The above is the title of a lecture delivered before the Ottawa Literary and Scientific Society upon Thursday evening, 21st November, by Mr. F. T. Shutt, the chemist of the Dominion Experimental Farms. This lecture, which was upon Oxygen, as the most important constituent of Atmospheric air, formed a fitting sequel to Mr. Shutt's lecture of last year, the subject of which was water, including the chemistry of Hydrogen.

Having given a concise statement of the ground he was about to cover, the lecturer began by giving a short resumé of his last year's lecture before the society, in order to show the connection between the two subjects. Previous to 1774, when Oxygen was discovered by Priestly, it was supposed that the air we breathe was one single gas—an element. The same experiment by which Priestly made this important discovery, namely, heating red oxide of Mercury, was performed before the audience. The Oxygen was given off as gas, which kindled to a flame a glowing ember placed in the mouth of the test-tube, while the mercury was deposited in a film on the sides of the glass. The lecture was earnestly listened to throughout, and there were frequent

bursts of applause as the following experiments were performed to illustrate the fact that Oxygen is the universal supporter of combustion in nature: Burning phosphorus, sulphur, charcoal, zinc, and iron, in glass globes filled with Oxygen.

It is worthy of remark that the whole of the above experiments "went off" the first time they were tried, so that the tedious delays which sometimes characterise chemical lectures illustrated by experiments were in this instance entirely wanting.

A hearty vote of thanks was tendered to Mr. Shutt at the close of his lecture.

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AMERICAN INSTITUTE OF MINING ENGINEERS.

That Canada is beginning to be better known by our neighbours across the line is evidenced by the increasing frequency of visits from scientific and other learned bodies from that quarter, and their inter-communication with this country is not only pleasant, but beneficial in its results. The recent visit, during October last, of the American Institute of Mining Engineers proved satisfactory in the highest degree to both visitors and those visited, and although the former were not counted by hundreds, yet those who came comprised some of the most prominent members of the profession, besides representatives of the technical institutions. In addition to the points of interest presented by the capital, to which the visitors were conducted, various excursions to points of the leading mining industries took place, that to the phosphate deposits of the Lièvre being the largest of all.

The copper mines of Sulbury, the asbestos district in the Eastern Townships, together with the copper and other mining industries of Quebec, were respectively made points of inspection, and the greatest delight was expressed by our guests. At the opening session, held in a committee room of the House of Commons, a number of most interesting speeches were made, among which that by Dr. Raymond, the secretary of the Institute, was a veritable piece of word painting. He alluded to the beauties of our natural scenery, to our waterfalls, rivers,

and the great lakes which he styled as "yours and ours." They appeared to his view the more beautiful in contrast with a lake visited by the Institute last year which he considered "the incarnation of selfishness," receiving everything and giving nothing, not even fruitful enough for the support of fish or to feed the gulls hovering over it—Great Salt Lake.

The opinion of Canada carried away by the members of the Institute is, judging from letters written by several of them since their departure, most appreciative, and it is in the range of probability that in 1891 they will again visit Canada to hold their annual meeting, probably on the shores of Lake Superior.

The readers of the OTTAWA NATURALIST will be pleased to hear that, since the meeting, Mr. H. Beaumont Small, one of our members and the President of the Ottawa Scientific and Literary Society, has been elected a member of the Association in recognition of his writing upon mineralogical subjects. J. F.

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BOOK NOTICES.

THE ENGLISH SPARROW (*Passer domesticus*) IN NORTH AMERICA, ESPECIALLY IN ITS RELATIONS TO AGRICULTURE. BY WALTER B. BARROWS, ASSISTANT ORNITHOLOGIST, U. S. DEPARTMENT OF AGRICULTURE. WASHINGTON, 1889.

This is Bulletin No. 1 of the Division of Economic Ornithology and Mammalogy, of the United States Department of Agriculture, prepared under the direction of Dr. C. Hart Merriam, the Ornithologist of the Department. It embodies the results of investigations of the much discussed English Sparrow question in North America, carried on principally in the year 1886, for the purpose of determining whether the relations of this bird to agriculture were beneficial or otherwise.

Part I contains summaries of the evidence which has been collected by the Department, and which is printed at length in Part II. This is considered and carefully weighed in all its bearings, and the conclusions arrived at are systematically and conveniently arranged. A short history is first given of the introduction of *Passer domesticus*, into

North America, and of its spread and increase. This is followed by a consideration of the evidence, *pro* and *con*, first as to direct injury to field crops, gardens, &c, then as to the relations of this sparrow to other birds beneficial to agriculture, and finally with regard to its insectivorous habits. A careful and impartial survey of the evidence on both sides can hardly fail to convince any fair-minded person, as it has the writer of the bulletin, that "The English Sparrow is a curse of such virulence that it ought to be systematically attacked and destroyed before it becomes necessary to deplete the public treasury for the purpose, as has been done in other countries." Recommendations for legislation and of various methods of exterminating the pest are then given, followed by an interesting paper on trapping sparrows for sporting purposes by Mr. W. T. Hill, of Indianapolis, Ind., and by a short history of the House Sparrow and of the European Tree Sparrow, (*Passer montanus*) at St. Louis, Mo., by Mr. Otto Widmann. The report on the insectivorous habits of the English Sparrow is contributed by Prof. C. V. Riley, Entomologist of the Department, while the paper on the destruction of sparrows by poisons was prepared by Dr. A. K. Fisher, Assistant Ornithologist. A carefully prepared map shows the enormous amount of territory over which the sparrow has spread in the thirty-seven years since its introduction.

Dr. Merriam, who personally wrote but a small portion of the book, is to be congratulated on having such a painstaking and competent assistant as Mr. Barrows has shown himself to be in the authorship and compilation of this bulletin.

W. A. D. L.

GEOLOGICAL AND NATURAL HISTORY SURVEY OF CANADA. Alfred R. C. Selwyn, C.M.G., LL.D., F.R.S., F.G.S., &c., Director, Report for 1887. Several parts of Vol. III of the new series are out.

(A) SELWYN—Summary Report of the Director for the years 1887 and 1888; (B) DAWSON—Report on an Exploration in the Yukon District, N.W.T., and adjacent portions of British Columbia; (C) BOWMAN—Report on the Geology of the Mining District of Cariboo, British Columbia; (E) TYRRELL—Notes to accompany a preliminary map of the Duck and Riding Mountains in Northwestern Manitoba; (F) LAWSON—Report on the Geology of the Rainy Lake Region; (H) INGALL—Report on Mines and Mining on Lake Superior; Pt. A: His-

tory and general conditions of the region ; Pt. B : Silver Mining ; (J) Low—Report of Explorations in James' Bay ; (K) ELLS—Second Report on the Geology of a portion of the Province of Quebec ; (M) BAILEY AND MCINNIS—Geology of portions of New Brunswick, Quebec and Maine ; (R) DAWSON—The Mineral Wealth of British Columbia, with annotated list of localities of minerals of economic value ; (T) HOFFMANN—Chemical Contributions to the Geology of Canada.

Besides the above Reports there have also appeared (a) Mr. Brumell's Report of the Mineral Statistics for 1888, and (b) Supplementary Note on Silver Mining in the Lake Superior district by Mr. Ingall.

H. M. A.

“ON THE CAMBRIAN ORGANISMS IN ACADIA.” By G. F. Matthew, M.A., F.R.S.C. Can. Rec. Sc., Vol. III, No. VII, 383-387, Montreal, July, 1889.

This number of the “Canadian Record of Science,” which contains no less than six palæontological contributions, opens with Mr. Matthew's paper above cited. It forms an abstract of a paper read before the Royal Society of Canada in May, 1879. The author enumerates the recent discoveries made in the fauna of the St. John (Acadian) group, and points out their significance in the light of what is at present known of the Cambrian system in Russia, Sweden, &c., and elsewhere in America. From the lower part of the Basal or Georgian series, Mr. Matthew has obtained representatives of no less than three families of sponges, besides “Radiolarians” or allied organisms. The flora of that early period is marked by the presence of a Palæochorda and a Fucoidea, *F. circinatus*, Bgt., whilst brachiopoda are represented by what appears to be the *Mickwitzia monilifera* of Schmidt; Crinoidea, by “undoubted examples of *Platysolenites* (Pander)” besides “*Volborthella tenuis*, a minute cephalopod.” The St. John or Acadian group is then divided into four general stages or divisions, the uppermost of which belongs to the Ordovician system ; these divisions are as follows :—

Fauna and Flora of Division (stage) 1.—(Paradoxides Beds).

Fauna of Division (stage) 2.—(Olenus Beds).

Fauna of Division (stage) 3.—(Peltura Beds).

Fauna of Arenig group (Ordovician).

Palaeontological notes are given under each of these divisions showing the organisms which characterize them, and reference made to the new species described for the first time, all of which will appear in the next Trans. Roy. Soc. Can. The paper closes with a brief and clear exposition of the physical history of Southern New Brunswick in Cambrian times as shown by the Cambrian formations themselves.

H. M. A.

"ON FOSSIL SPONGES FROM BEDS OF THE QUEBEC GROUP OF SIR WILLIAM LOGAN AT LITTLE METIS." By Sir J. W. Dawson, LL.D., F.R.S. Can. Rec. Sc., Vol. III, No. VII, p. 429. Montreal, July, 1889.

This is an abstract of a lengthy paper read before the Royal Society of Canada at the May meeting, 1889, in which the additional material obtained by Dr. Harrington and the author at Little Metis is given. That paper gave "a detailed account of the containing beds, with a map and sections, and describes the species found, which are about eleven in number, all siliceous sponges and most of them hexactionellid. There are six *Protospongiae*, one *Cyathospongia*, and five other sponges belonging to new genera described in the paper. Other species found in the same beds indicate the presence of the genus *Linnarssonina*, also of a new fucoid, *Buthotrephix perygracilis*, whilst the sandstones hold "*Retiolites*, probably *R. ensiformis* of Hall," the *Trigonograptus ensiformis* of more recent classifications. H. M. A.

"NEW FOSSIL PLANTS FROM THE NORTH-WEST." By Sir J. W. Dawson. Can. Rec. Sc., Vol. III, No. VII, p. 430. Montreal, July, 1889.

This is a note which calls attention to the Upper Laramie plants recently studied by Sir William, from Mr. McConnell's collection in the Mackenzie River basin, and from Mr. Weston's in the Bow River valley. Striking resemblances are noticed between the flora from these two localities and the flora of other parts of the North-West, of Alaska, the Hebrides, Spitzbergen, the United States and Greenland, and the whole will form a very interesting contribution to be given in the forthcoming Volume of Transactions. H. M. A.

"ON SOME OSTRACODA FROM THE MABOU COAL FIELD, INVERNESS CO., CAPE BRETON (NOVA SCOTIA). By Prof. T. Rupert Jones, F.R.S., and J. W. Kirby. Geol. Mag. No. 300, Dec. III, Vol. VI, No. VI, p. 269. London, June, 1889.

This paper is the result of a critical examination of species of carboniferous ostracoda which were collected by Mr. A. H. Foord, late of the Geological Survey, Canada, in 1884, at the Mabou coal field, and which were sent to Prof. Jones in 1886. The following forms have been recognized or described, the new one, *Carbonia fabulina*, var. *altilis*, being well illustrated by four wood-cuts:—

1. *Carbonia fabulina*, J. and K.
2. " " var. *altilis*. N. var.
3. " (?) *bairdioides*, J. and K.

The precise stratigraphical position of these ostracoda is given from Mr. H. Fletcher's Report, addressed to the Director of the Geological Survey of Canada, in which a list of the associated species and other fossils described by Mr. Whiteaves is also given. H. M. A.

"GLACIATION OF EASTERN CANADA." By Robert Chalmers, of the Canadian Geological Survey. Geological Magazine, Dec. III, Vol. VI, No. 299, p. 211. London, May, 1889.

This contribution by Mr. Chalmers, a member of our Club, is a preliminary note in advance, of an exhaustive paper on the "Glaciation of Eastern Canada," which "will shortly appear in the Canadian Record of Science, Montreal." It presents the subject in a clear and succinct form, pointing out the conclusions which are at variance with those held by extreme glacialists, and shows how "the theory of local glaciers upon the more elevated portions of the country and icebergs or floating ice striating the lower coastal areas during the post-Tertiary submergence of these, as maintained by Sir William Dawson, will serve to explain all the observed phenomena." Mr. Chalmers's conclusions are based on data collected by himself for many years in connection with his geological studies on that "battle ground, so to speak, of the advocates of the two rival theories of continental glaciation and floating ice," together with the vast amount of notes obtained by Sir William Logan, Sir William Dawson, Dr. G. M. Dawson, Dr. Bell, Dr. Ellis, Dr. Lawson, Messrs. Alexander Murray, H. Fletcher, A. P. Low, and others of the Geological Survey staff, and the other in Nova Scotia, New Brunswick, Quebec and the Archaean areas as far north as Hudson Bay. Mr. Chalmers has found that the evidences point naturally and clearly to the action of local glaciers and floating ice as the agencies which

have striated and polished rock surfaces during the glacial epoch and the subsequent period of submergence. The term "local glacier" Mr. Chalmers defines as "an ice-sheet limited in extent, that is, confined to one valley or hydrographic basin, whether large or small, and influenced in its movements by local topographic features, such as mountains, watersheds, hills, or the valleys of large rivers." We look forward with much interest to Mr. Chalmers's forthcoming paper in the *Canadian Record of Science*.

H. M. A.

"GLACIATION OF HIGH POINTS IN THE SOUTHERN INTERIOR OF BRITISH COLUMBIA." By Dr. G. M. Dawson, Asst. Dir., Geol. Surv. Can. *Geol. Mag.* No. 302, Dec. III, Vol. VI, No. 8, p. 350. London, August, 1889.

This very timely contribution to the history of the "Great Ice Age" problem in geology, throws additional light upon the glacial phenomena of Southern British Columbia, where Dr. Dawson has been carrying on his explorations in connection with the Geological Survey of Canada. Whilst Mr. Chalmers's paper deals particularly with the eastern portion of Canada, Dr. Dawson calls attention almost at the same time to the Pacific border of Canada—both papers being of great interest and import, as bearing on the same question from two widely separated standpoints. In the August number of the *Geological Magazine* for 1888, Dr. Dawson presented the results of his investigations in northern British Columbia, and specially in the Yukon country, where it was shown that the ice mass flowed in a northerly direction, whilst in the southwesterly portion of the same province the ice mass moved in a westerly course. This latter ice mass Dr. Dawson styled the "Cordilleran Glacier." The purport of the paper is to call attention to the noteworthy heights at which glaciation has now been found to occur on some of the higher parts of the interior plateau and its mountains and to the great mass thereby indicated for the southern part of the "Cordilleran Glacier." Whilst 5,280 feet (one mile) above the sea level had been previously noted as the highest point for glacier ice markings, at Iron Mountain, it has been since ascertained that Tod Mountain, 25 miles north-east of Kamloops, rising 7,200 feet above the sea, shows indubitable evidence of the movement of a great glacier ice-mass entirely independent of the local features of the country. A table

giving the height above the sea at which evidence of glacial action occurs accompanies the paper. In one locality the highest point of glaciation is over four thousand feet, in four other places it is over five thousand feet, and in two more over six thousand feet above the sea, whilst Tod Mt., the culminating point, shows evidence of glacier ice or nivie-ice action at the extreme height of 7,200 feet. H. M. A.

“ON A NEW GENUS OF SILICEOUS SPONGES FROM THE TRENTON FORMATION AT OTTAWA.” By George Jennings Hinde, Ph.D. Can. Rec. Science, Vol. III, No. VII, p. 395. Montreal, July, 1889.

From specimens of sponges discovered by Mr. Walter R. Billings, of our Club, and presented to the national collection at Ottawa, Dr. G. J. Hinde, well known for his researches in fossil sponges—to whom the material was transmitted by Mr. Whiteaves—has recognized and described a new and interesting genus of Lithistid sponges. The generic designation *Steliella* is that proposed and described, and indicates two species, both from the Trenton formation of this city, viz: *S. Billingsi* and *S. crassa*. The genus *Steliella* finds its nearest ally in the genus *Astylospongia*, Römer, “but the nodes are less developed and the network is much less regular.” The canal apertures of the surface, and the shape of the sponge as well, resemble some forms of *Calathum*, Bill., such as *C. Anstedii* and *C. Fittoni*, but the spicular structure in these latter is as yet unknown.” A plate of six figures, drawn by Mr. L. M. Lambe, accompanies the paper, four of which illustrate *S. Billingsi*, named after our member, Mr. W. R. Billings, so well known as an indefatigable worker in the Trenton of Ottawa, and the two others illustrate *S. crassa* both in its external and internal or microscopic characters.

H. M. A.

“NOTES ON THE LAKE ST. JOHN COUNTRY.” By E. T. Chambers. Can. Rec. Sc., Vol. III, No. VII, p. 388. Montreal, July, 1889.

This contribution to the geography and geology of the district in question contains some interesting notes obtained since the Lake St. John Railway opened. Outcrops of “Silurian,” more properly Cambro-Silurian or Ordovician, limestones are noted, also peculiarities in the Laurentian area along the route travelled. Amongst the fossil remains noted, one, a *Cryptozoon*: *C. boreale*, has been so named by Sir William

Dawson, a description of which will be given in a future number of the Record. The statement that *Halysites* occurs in the Trenton formation of Roberval and is a characteristic species of that formation, the present writer is inclined to doubt the accuracy of. H. M. A.

"CONTRIBUTIONS TO THE MICRO-PALÆONTOLOGY OF THE CAMBRO-SILURIAN ROCKS OF CANADA." By E. O. Ulrich, of the Geological Survey of Illinois, U.S.A. Published by the Geological and Natural History Survey of Canada. Montreal, 1889.

This Report contains fifty-six pages of letter press and two lithographic plates, giving descriptions and notes of two new genera and twenty-six species and varieties of *Bryozoa* and ten species of *Ostracoda* collected by officers of the Geological Survey of Canada in the Province of Manitoba. Among these there are ten new species of *Bryozoa*, one new variety, along with five new species of *Ostracoda*. They are as follows:—BRYOZOA. *Monticulipora parasitica*, var. *plana* (n. var.); *Diplotrypa Westoni* (n. sp.); *Batostoma Manitobense* (n. sp.); *Petigopora scabiosa* (n. sp.); *Bythopora striata* (n. sp.); *Fistulipora laevata* (n. sp.); *Goniotrypa bilateralis* (n. sp.); *Pachydictya hexagonalis* (n. sp.); *P. magnipora* (n. sp.); *Ptilodictya Whiteavesi* (n. sp.); *Nematopora* (?) (n. sp.) OSTRACODA: *Leperditia subcylindrica* (n. sp.); *Primitia latioia* (n. sp.); *Primitia* (? *Beyrichia*) *parallela* (n. sp.); *Eurychilina reticulata* (n. gen. et n. sp.); *E. Manitobensis* (n. sp.); *Streptula lunatifera* (n. sp.)

H. M. A.

"ON THE DISCOVERY OF TURRILEPAS IN THE UTICA FORMATION (ORDIVICIAN) OF OTTAWA, CANADA." By Henry Woodward, LL.D., F.R.S., F.G.S. Geol. Mag. No. 300, Dec. III, Vol. VI, p. 271.

In this contribution to the palæontology of the rocks about Ottawa, Dr. Woodward, Keeper of the British Museum, &c., &c., has described a very interesting and beautiful little species of cirripede found by Mr. Ami, of the Geological Survey, in the "Siphonotreta band" or zone along the right bank of the Rideau river at the head of the Rifle Range Rapids. This species is described by Dr. Woodward as *Turrilepas Canadensis*, and the description is accompanied by an enlarged figure of the same. A note by Mr. Ami on the exact geological position of this cirripede is included in Dr. Woodward's paper, and the species referred to the Lower Utica formation. J. F.

"ON A SPECIES OF GONIOGRAPTUS FROM THE LEVIS FORMATION, LEVIS, QUEBEC." By Henry M. Ami, F.G.S. Can. Rec. Sc. Vol. III, No. VII, p. 222.

In this paper the writer records the discovery in America of a genus of graptolites which was hitherto known only from "the Llandeilo flags of the Bendigo goldfield, Sandhurst, Victoria, Australia." Prof. McCoy had described the Victorian species as *Graptolithus* (*Didymograptus*) *Thureani*, and suggested the generic term *Goniograptus* for its reception at some future date. Prof. Lapworth soon recognized the validity of this genus. No specimens or other species of this genus were found until 1866, when Mr. T. C. Weston obtained the first American examples from the black graptolitic and linguliferous beds in the cutting on the I. C. R. 1560 paces below the Lower Levis and Quebec ferry. The Canadian examples of the *Goniograptus* cannot be specifically separated from the Australian species, *G. Thureani*, McCoy, although they show a new generic feature in the presence of a disc or membranaceous wing-like expansion clasping the stolons. The varietal designation *Goniograptus Thureani*, var. *Selwyni*, has been suggested for the Canadian representative of the species, inasmuch as Dr. Selwyn was the first to discover graptolites in Australia (1856), which determined the age of the gold reef bearing slates of Victoria.

J. F.

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EXCURSION TO CASSELMAN.

Upwards of thirty availed themselves of Mr. Craig's kind invitation to visit his farm on the Nation River, at the Ox-bow near Casselman, on August 8th. Arrangements were made with the Canada Atlantic Railway to let the party off at this point, and take them up again there in the evening, a great convenience to those who wished to spend the day in the immediate vicinity of the farm. The majority did so, and found it a most delightful spot, full of cool retreats from the fierce noonday sun, and teeming with animal and vegetable life in its most interesting forms. Many rare specimens in the various branches of natural history were collected or observed during the day. Some

half-dozen members braved the heat and discomfort of a three-mile tramp to Casselman on the railway ties, and were rewarded by finding some interesting relics of a by-gone age in the shape of broken Indian pottery, and by the somewhat novel sensation of a bath in the rapids below the Village, where the water runs at immense speed over large tables of flat rock. Addresses were, as usual, given before leaving, on the collections and observations of the day, by the leaders of the different branches, and were listened to with great interest. The unanimous verdict of the members when they gathered for the return journey was that our excursion to the Ox-bow had been one of the most pleasant and profitable ever held by the Club. The hearty thanks of the Club are due to Mr. Craig and his family, as well as to Mr. Summerby, for the kindness shown the members and their friends. Mr. Craig's hospitality will always be remembered with feelings of gratitude by those who had the good fortune to partake of it at the Ox-bow farm.

W. A. D. L.

BACK NUMBERS.

Attention is called to the changes in the list of prices of back numbers of the Club publications, on the second page of the cover. To members only, the back numbers are now furnished at cost price, thus enabling them to procure or fill up sets at comparatively small expense.

W. A. D. LEES,
Librarian.

NEW MEMBERS :—Miss I. M. Ballantyne, Messrs. Jeffrey H. Burland, B. App. Sc., F. C. S. ; J. B. Dowling, B. App. Sc. ; J. Rainson Wills (Buckingham), Capt. Edgar A. Meams, U.S.A., Fort Snelling, Minn.

EDITORIAL.

The present number brings to a close the third volume of the OTTAWA NATURALIST. The favourable notices which have appeared in current periodical literature have been very encouraging, and the demands for numbers from outside naturalists—which are constantly increasing—are evidences of the growing appreciation of our efforts. The experiment was tried during the past season of publishing the magazine in quarterly instead of monthly parts; but so many of our subscribers have expressed regret at this change in the method of publication, thinking that much greater interest in the work of the Club is kept up by the monthly issue of the proceedings and notices of meetings, that the editor has felt it his duty to request the Council to bring the advisability of returning to the monthly issue before the Club for consideration at the next annual meeting, which will be held in the museum of the Ottawa Literary and Scientific Society on Tuesday afternoon next, 18th March, at 4.15 p.m. There are several matters of unusual importance to come before the meeting, and the Council is particularly anxious to have a large attendance. Amongst other matters of great interest to the Club, upon which the members will be asked to express their views, is one provided for last year, to wit, the addition of three lady members to the Council. This step it is considered will materially increase the usefulness and popularity of the Club. It is most desirable that there should always be a good representative attendance at the annual meetings for many reasons; but particularly so when changes of importance are made in the management such as that which is now proposed. Owing to the high class of papers which have been read before the Club during the past winter, most of which are already in the hands of the editor, the numbers of the NATURALIST for the coming year will be of exceptional interest. The usefulness of the Club as an educational institution and as a means of providing beneficial and enjoyable recreation is generally acknowledged by all who have had their attention drawn to it. The editor begs to thank the members of the Club for the assistance and encouragement they have given in the past. There are, however, two things in which every member of the Club can render signal service to the editor

without putting themselves to inconvenience. These are (1) by increasing the membership of the Club. There are few people who have not, at any rate, one friend, who "for their dear sakes" would give a dollar a year to a good cause. If every member of the Club would obtain one new member, the OTTAWA NATURALIST would then be made the most successful Natural History Magazine in North America. (2) By paying their subscriptions *when they are due* at the beginning of the Club year (3rd Tuesday in March). The subscription is necessarily payable in advance, because all payments for printing the NATURALIST, rent of rooms, postage, stationery and binding, have to be met as they fall due, and our only sources of revenue are the dollar a year paid by each member and the advertisements on the cover of the NATURALIST. Moreover, the advantages offered by the Club are so considerable that it is seldom so much can be got in return for a dollar. *Lege et mirare!!* The OTTAWA NATURALIST is sent free, as issued, to every member; admission is free to all the evening lectures and popular afternoon lectures; there is a reduction in the price of tickets at all the excursions, which alone frequently amounts to a saving of half the annual subscription; the back publications of the Club are now furnished to members at the actual cost of printing, a saving in those already printed (from the published prices) of \$2.56;—Is not this enough for a dollar? If not, come to the annual meeting and tell us in what else we can meet your wishes.

In conclusion, the editor begs to tender his sincere thanks to Mr. W. A. D. Lees for his most timely and valuable help as assistant editor during the year.

J. F.

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AGRICULTURAL GRASSES AND FORAGE PLANTS OF THE UNITED STATES BY DR. G. VASEY.

The new and enlarged edition of Dr. Vasey's Agricultural Grasses has been received. It is a large pamphlet of 148 pages and is illustrated by 114 plates. The printing and get up of this work are of the usual excellent quality of the United States documents. It is largely a revised edition of that of 1884; but much valuable new information has been added. In the present report the principal forage plants, other than grasses, which are employed in agriculture, are treated of. The plates are very fine and will be invaluable to those wishing to make a study of grasses. Pl: 1-4 are devoted to illustrating the different parts of grasses, and a glossary of the terms used in describing these plants is given.

J. F.

GEOLOGICAL PROGRESS IN CANADA.

PRESIDENT'S INAUGURAL ADDRESS.

BY R. W. ELLS, LL.D., F.G.S.A.

(Delivered Dec. 13th, 1889.)

Mr. Chairman, ladies and gentlemen, in opening the present series of soirees and lectures pertaining to the Ottawa Field Naturalists' Club, I can only regret that the task has not fallen on some one of its many members, who from a larger and more intimate acquaintance with the work and aims of the Society, would have been much better fitted to present its claims and to advance the subject in all its bearings. As, however, accident or design has placed the responsibility on my shoulders I will attempt to lay before you, briefly, a few facts bearing upon the Club's actual condition, and strive to indicate what, under proper and wise guidance, and with a due manifestation of interest on the part of its members will conduce to the undoubted successful future to which the Society should do its utmost to aspire.

Established in 1878 by a small body of enthusiastic amateurs in the study of the various branches of Natural History, this Society has grown steadily in public favor, till now we are happy to point to a membership of not far from 250 persons. Among these we are proud to be able to number many of our best and most enterprising citizens, both ladies and gentlemen. We include in our list, I think, nearly or quite all those whose tastes and inclinations have led them to desire a more intimate acquaintance with the wonderful and beautiful things of nature, either through the agency of the regular excursions which are held during the summer months, or through the lecture courses in which many of the notes and facts then obtained are presented in attractive form, and in a manner in many respects probably more instructive. Of our members, while many may not lay claim to the title of scientists, in the strict acceptance of the term, it may be said, that, by some, at least, much excellent and lasting work in the cause of science has been accomplished, as can be readily seen by reference to the published volumes of the Club's Transactions; while of many others it may be safely asserted that a large store of valuable notes and obser-

vations have been made by them on the various subjects of natural history, the results of which have not yet been presented to the society, possibly for the reason that in many persons a certain innate modesty or a lack of confidence in their own powers has heretofore restrained them from taking a more active part in the work or discussions of the Club. To bring such members more fully into the light, and to secure their hearty co-operation and valuable assistance, and to provoke a spirit of enquiry generally, on their part, concerning the beauties which lie around us on every hand, is one of the first aims of this institution. While we acknowledge that much has already been done in this direction, our hopes will not have been fully realized till we see far richer results.

It may not be generally known that in our membership we now include the greater portion of the official staff of the Geological and Natural History Survey of Canada, comprising a body of men eminent in many branches of science and well known throughout the scientific world. And in this respect we are, as a club, clearly in advance of any other similar scientific institution at least in Canada, if not in the adjacent country of the United States. Of these it may be said that while for well recognized reasons the chief result of their observations, in the field or otherwise, may not be directly available to us as a private institution, many important, interesting and valuable facts bearing on the several branches of natural history and geology, as well as sketches of explorations of our hitherto but little known and vast stretches of territory, can be presented at our meetings and incorporated in the Club's Transactions, thus rendering this publication one of the most valuable of the scientific journals published in any country. I cannot but feel that in this Club, as at present constituted, we have a membership sufficient to entitle us to a very high position among scientific institutions at large, and that it, in reality, depends upon ourselves to make the Ottawa Field Naturalists' Club a true power in the land, and its published Transactions of such value as to be eagerly sought after by scientists and those interested in science generally all over the civilized world. I am impelled or rather authorized to say this, more particularly at this time, in view of the fact that up to the beginning of the present year, according to a clause in the late constitution of

he Club, its operations were almost entirely confined to scientific work in the more immediate vicinity of Ottawa. By this clause it can easily be seen that the work of most of the active members of the Geological Survey, whose fields of research lay at points remote from this city, was almost entirely excluded, and as a necessary consequence the members of that staff, who should constitute a very important factor in the successful working of the society, to a very large extent lost interest in the Club's work as a whole. By a unanimous vote at the last general meeting this clause of the constitution was amended in order that the scope of the Club's work could be enlarged and embrace the reading of papers, discussions and observations by any of its members on subjects of scientific interest from any portion of the Dominion, and a glance at the programme prepared for your entertainment and instruction during the coming winter will show you at once the direct practical outcome of this modification of the Club's policy, since it will there be seen that no less than six papers, all of which promise to be of great interest, and comprising localities which extend from Labrador on the east to the Arctic Circle and the great Yukon Country on the west and north, will be read by members of the Geological and Natural History Survey of Canada, and it may be said here that only the lack of time or opportunity at our disposal has prevented the obtaining of others of equal interest and importance from the same source.

With, therefore, such an array of facts as we have just stated, and with so attractive a programme as we are now enabled to present to the members of the institution and to the general public as well, it is most confidently anticipated that much of the indifference, or lack of interest, to use a milder term, which has apparently been evinced by many members in the working of the society, will now disappear. The programme of papers and lectures for our present course is of such interest and importance as in any other town or city would attract so great an audience that our present room would be inadequate for their accommodation, and I can but feel, and so feeling, strive to impress upon every member of the Ottawa Field Naturalists' Club, the great desirability of placing the society of which we are all members in so distinguished a position that every one of us can point with gratification

to the fact that he is a member of this body of earnest workers in the cause of science generally.

Concerning the work of the summer just past, I can or need say but little. The several excursions were very successful, well attended, and enjoyable, and many facts new to members were obtained. The study of Nature in the field is, after all, the only true method in which we can obtain a correct knowledge of her mysteries. Many a geologist can, in his office and at his leisure, write learned dissertations on the geological structure of a country about which but little is known, which may, indeed, read very well and seem perfectly plausible, but which, upon actual test in the field, in some way do not appear to meet all the requirements. It is, in all scientific work, only by "thought and dint of hammering," as one of our members so happily puts it, that the fundamental truths can at length be reached. Ornithology, botany, entomology, in fact all the branches of natural science acquire a tenfold interest when their study is taken up in direct connection with the objects studied, but when, by this study in the field, we have obtained all the facts possible bearing on the subject, then comes the perfecting process by their careful and minute study indoors. It is this feature in the working of this Club, as originally contemplated, which, though possibly at times lost sight of, renders this Society so valuable, since it carries on, or at least endeavors to carry on, its work exactly in this way, and it is precisely for this purpose that the evening soirees were at first inaugurated, that members who have spent the months of summer in collecting facts, may have an opportunity of presenting these before the membership of the Club, and may receive needed information or light upon any point that may appear to them puzzling or obscure. The accounts of the several excursions, and the results attained, will be found embodied in the several numbers of the Club publications for the past summer, and it is, therefore, needless for me to further refer to them here, since we infer that every member has long ere this carefully read the contents of each number as it appeared.

It may not be out of place here to refer to one aspect of scientific work, the consideration of which has a very important bearing on the question generally. Many persons have asked me, as they have doubtless asked every student of Nature in her many forms: What is the

practical outcome of all this? What benefit, direct or indirect, do we, as a people, expect to derive from such an expenditure of time or money on the part of the individual or of the nation? Now, while to a body of strictly scientific workers the consideration of such a question would be quite unnecessary, it is possible that there may be, even here, some who have thought over this question from this practical standpoint. And, first of all, I suppose it may be safely asserted that every scientific subject has a twofold aspect, viz.: first, its study from a purely scientific point of view and in the interests of science properly so called; and, secondly, its economic importance. Thus, if you were to ask the entomologist what practical good he expects to derive from the study or serious contemplation of bugs or insects, he would readily say that many of these insects are injurious to the growth or development of certain valuable fruits or grains, and the study of their habits, their methods of existence, and the means by which their destruction can best be effected, forms an exceedingly important branch of study, in order that their encroachments may be most successfully resisted or their extermination most readily effected. So, also, with the ornithologist, the study of the habits of certain birds, injurious or otherwise to vegetation, as in the case of the English Sparrow or other species, is considered so important that special investigations in this direction have been undertaken by our neighbors across the line. As regards the problems of geological science, the economic aspect of the question is of special value in many ways; since upon the character of the rocks beneath the surface depends very largely the agricultural value of soils which have been produced by their disintegration or decay, and the determination of areas suitable for successful settlement and their fitness for the growth of certain important classes of food products. The determination of mineral-bearing belts, and the probabilities of the profitable expenditure of capital in the search for economic minerals, also in great measure depend upon the correct determination of geological horizons, and constitute one of the most important of the practical problems presented by the study of the science of geology. With many of those who regard scientists, as a class, simply as cranks of a higher growth and as persons who have no clear conception of the objects for which they are working, it is very evident that the consideration of these

aspects of the question has never entered into their calculations, since the resulting benefits, even in the pecuniary sense, to every form of industry now known, not merely in those more especially connected with the study of the natural sciences, but in those which enter more closely into the avocations of every day life, have only been obtained by dint of hard, close and unremitting study of Nature's secrets by some one of those so called cranks, whose greatest and sometimes only reward very often is the inward satisfaction derivable from the thought that he is at least doing something for the general good of man, to advance the general interests of his country, or render more immediately and readily available the boundless stores of wealth which our great mother earth holds treasured up in her capacious bosom.

It has been suggested that for this opening paper some account of the progress of geological work in Canada might be acceptable. I need not say here that the exposition of such a subject, to give it any small measure of justice, would require a length of time much better measured by hours than by the few minutes at my disposal this evening, even were I in a position to discuss a subject of such magnitude, a subject the extent of which is only equalled by the greatness of our country itself. The only thing I can, therefore, hope to do in such a case is to give you some slight idea of the early work and of the workers who have labored in this field, to sketch briefly the outlines of the investigations carried on by the members of the Geological Survey and by others who have contributed in greater or less extent to the unravelling of some one of the many problems of geological structure which are everywhere presented, and to point out, if time permits, some few of the difficulties that yet remain to be overcome in order to arrive at their final and satisfactory elucidation.

For this purpose, the progress of geology in Canada may perhaps be divided into three parts, the first of which may be held to include the work done before the establishment of the Geological Survey; the second, that of the period in which the late Sir William Logan directed its operations; and the third, that of the last twenty years, during which the present director, Dr. Selwyn, has filled that position.

The writings of the early explorers in Canada, say in the latter part of the last and the beginning of the present century, do not contain

very much relating to its geology. While some notice was taken of the occurrence of some of the best known minerals, such as iron and coal, no attempt was made in any way to interpret the structure or explain the general geological conditions which prevailed. This can easily be accounted for from the fact that the study of the science at that date was in its earliest stages, and even in England and on the continent of Europe, the discussion of geological problems was attended with but small satisfaction. The formation of the Geological Society of London, in 1807, furnished a starting point for better work and more careful observations, and marks the beginning of the era when the study of the various rock formations may be said to have been undertaken in the right spirit. In Canada itself the conditions of geological study were somewhat peculiar. Prior to Confederation, each province, with the exception of Ontario and Quebec, controlled its own affairs in this direction, and although the present Geological Survey was established nearly fifty years ago, or in 1842-3, its operations were for twenty-five years almost entirely confined to the provinces mentioned. Before this date, however, individual explorers, or rather observers, prominent among whom may be mentioned the names of Bigsby, Bayfield, Bonnycastle, Ingall and Lyell, had, in the course of their wanderings, begun to study in some detail the character of the various rock masses encountered, and their papers, communicated to the Geological Society of London and to the Literary and Historical Society of Quebec, constitute the first literature on the subject of Canadian geology. Of these, in so far as I can learn, the earliest geological description of any section is contained in a paper read by Dr. Bigsby, in London, in 1823, and published in the Transactions of the Geological Society, in 1826. on the "Geography and Geology of Lake Huron," in which the character of the rocks about the great lakes and at various points along the north side of the St. Lawrence was described. In this paper the rocks are simply divided into the *Primitive*, a term which was held to embrace much or all of what we now regard as Laurentian and Huronian, or at least Archean, and the *Secondary* or stratified portion: the present arrangement of geological systems of nomenclature not having been invented till some years later.

The entire list of papers published on the geology of Canada proper, or old Canada, prior to 1843, numbered about fifteen. Of these two were by Dr. Bigsby, two by Capt. Bayfield, R. N., two by Capt. Bonnycastle, R. N., and six by Lieut. Baddeley, R. E., so that it may be said that our geology of that time was largely in the hands of the army and navy. That much of the work then done was of a high order is evident from the tributes subsequently paid to these observers by Sir William Logan, who, in the preface to the *Geology of Canada*, 1863, speaks of them as follows:

“Admiral Bayfield has communicated to the Literary and Historical Society of Quebec and to the Geological Society of London various interesting papers on subjects connected with Canadian geology, with the facts in which it will be found that we have on several occasions availed ourselves.

“Among the pioneers of Canadian geology no observer was more accurate than Dr. J. Bigsby, Secretary to the Boundary Commission under the Treaty of Ghent. His range of investigation extended from Quebec to Lake Superior, and beyond the limits of the province in that direction, and he has accumulated and published a great store of facts upon the exactness of which the greatest reliance can be placed.

“Lieut., now Major-General, Baddeley, of the Royal Engineers, when in Canada, now nearly forty years since, was an ardent promoter of geological enquiry, and his services were made available by the Provincial Government in explorations in the region of the Saguenay and in the Peninsula of Gaspé. To him we are indebted for the first published notices of the lower Silurian limestones of Lake St. John, Bay St. Paul and Murray Bay, as well as of the existence of gold in the drift of the Eastern Townships. Lieut. F. L. Ingall was another explorer who, about that time, did good mineralogical service in Government expeditions; the district to which his attention was directed being the country between the St. Lawrence and the Ottawa. Capt. R. H. Bonnycastle, R. E., at a somewhat later period, interested himself in the examination of various mineralogical and geological phenomena, more particularly in the neighborhood of Kingston, where his military duties had placed him. The results of his observations were given in

Silliman's Journal, 1831, and in other publications, and have been cited in this report."

Of the work of other observers, we have, in 1827, valuable notes by Dr. J. Richardson, who accompanied one of the Franklin expeditions to the north coast of America. In 1837, Mr. J. Roy, of Toronto, presented a paper, the first of its kind, apparently, on the superficial geology of Western Canada, in which he estimated the subsidence, from the evidence of terraces, at about 1,000 feet below the present sea level. In 1840, also, Mr. Kenwood gave some very interesting facts on the geology of northern New Brunswick, discussing the distribution of the granites of that area, the extent of the great carboniferous basin, and the presence of fossiliferous sediments about the Bay of Chaleur. But perhaps the most important paper at the close of this period was that by Sir Charles Lyell, in 1843, on the recession of the Falls of Niagara, embodying the results of a careful study of the peculiar conditions there presented; a paper often quoted since by writers on the subject of denudation and the geological history of the great lakes. This was followed in the same year by the first paper of Sir William Logan on Canadian geology, in which he described the distribution of Laurentian boulders along the St. Lawrence below Montreal and the presence of marine shells in the clay in the vicinity of that city.

The papers above enumerated may, as already suggested, be regarded as constituting the first period in the history of Canadian geology.

Before proceeding to the consideration of the work of the second period, or that embraced by the work of the Geological Survey under Sir William Logan, we may briefly glance at the history of explorations carried on in the provinces of Nova Scotia and New Brunswick, to which provinces the regular working of the Survey was not extended till the year 1868. During the period between 1830-40, Dr. Abraham Gesner, a well known physician of Nova Scotia, and celebrated even at that date as an ardent enthusiast in the study of the science of geology, began the study of the rock formations of that province. The conclusions he arrived at, after some years' investigation of the subject, were, in 1836, presented to the public in a volume entitled "Notes on the Geology and Mineralogy of Nova Scotia," a book possessing much

interest even at the present day. Dr. Gesner was not only a man of very distinguished ability, but a very close observer. He divided the rocks of the province into four grand classes, of which the first, and presumably the oldest, group was styled the primary, following the generally accepted nomenclature of that day, which he held to occupy the entire southern side of the province along the Atlantic sea-board. These were flanked throughout a great part of their extent, on the north-west, by a belt of clay-slates, or argillites, extending from the western extremity to the extreme north-east point. This area he included under the head of the clay-slate district. His third division, that of the red sandstone, embraced largely the great areas of the carboniferous system, and what is now regarded as the triassic, lying to the west and north of the preceding, while his fourth, or trap, district included a considerable extension of eruptive rock which forms the chain of the North Mountains along the south side of the Bay of Fundy and about the lower portion of the Basin of Minas, of special interest, both then and now, as affording some of the finest specimens of zeolitic minerals anywhere to be obtained.

While it may be generally stated that the structure of the province, as thus outlined by Dr. Gesner, has not been confirmed in every particular by the work of more recent observers, it must be said that many highly interesting points were brought forward, and have been sufficient to warrant the placing of Dr. Gesner's name in a prominent place among the earlier workers in the field of Canadian geology. He next took up the work in the adjoining province, New Brunswick, and, in a series of reports extending down to 1845, presented, likewise, a very fair summary of its structure and mineral wealth, a work, in fact, that for many years was accepted as the standard for that section. By him, also, the first geological maps of the two provinces were prepared, and it is a sad commentary upon human life to know that the closing years of a man so celebrated for scientific research, instead of being filled with the honours he so richly deserved, were embittered by neglect and poverty, insomuch that, through inability to meet some petty pecuniary liability, he even suffered incarceration in the common jail, and had it not been for the kindness of some one of his friends who chanced to hear of his position and procured his release, the closing hours of his life

would have been spent within the confines of the prison. Dr. Gesner evidently lived in advance of his day, but this sad ending of a life which had done so much to further the interests of the country will always stand out prominently as a bitter reflection upon the public men who permitted such a state of affairs to exist, could it possibly have been prevented.

Before leaving our sketch of Gesner's work, we may briefly call attention to his second volume on the "Industrial Resources of Nova Scotia," published in 1849. In this he expresses his indebtedness to several scientists, among whom were Messrs. Jackson and Alger, of Boston, and Sir. Charles Lyell, from whose conclusions, in some respects, Gesner continued to differ. As indicating the great advance in the science, as compared with the map of 1836, it may be said that in the volume of 1849 Gesner then divided the rocks of the province into no less than eight groups, of which the first, or primitive, rocks are now styled granite or hypogene; the second, or the non-fossiliferous stratified rocks, the Cambrian, corresponding largely to much of his former clay-slate division; third, the Silurian, containing characteristic Silurian fossils and resting in small areas on the flanks of the former; fourth, the Devonian, or old red sandstone group; fifth, the Carboniferous, or coal formation; sixth, the old red sandstone, now our Triassic; seventh, Igneous, or intrusive, rock; and, eighth, the Drift, or Boulder, formation. It may be said of this work that many of the conclusions then advanced are accepted even at the present day.

Although, as just stated, the operations of the Geological Survey did not for many years extend to this province, almost the first work done by Sir William Logan, in 1843, was the examination of the Cumberland coal field and the measurement of his famous Joggins section, a work that has ever since remained as a standard by which the rocks of other portions of the Nova Scotia Carboniferous formation can be measured, even to the present day. In the meantime, the study of the science in this direction had not been entirely neglected. Sir Charles Lyell carefully examined various portions of the province and the adjoining Island of Prince Edward, and, as a result of his travels, presented papers of great interest to the London Geological Society. But another Nova Scotian was now coming rapidly to the front, a man

whom we are all proud to recognize as one of the most prominent, not only among Canada's, but the world's scientists, who, as the labors of Dr. Gesner drew to an end, took up the work with renewed enthusiasm. In the course of his travels throughout the province in the discharge of his duties as Superintendent of Education, Dr. Dawson, now Sir William Dawson, acquired a store of facts concerning the character and distribution of the various geological formations far greater than Dr. Gesner had been able to obtain. These facts were elaborated in much greater detail than was possible by his predecessor, owing to the great and rapid strides which had been taking place in the history of the science, and were, in 1855, presented to the public in the first edition of that celebrated work, the "Acadian Geology." It is not, probably, too much to say that while Logan was so successfully carrying on his great work in old Canada, Dawson, unaided, in his little province by the sea, was doing work equally as faithful and as productive of great results, and not only as the author of "Acadian Geology," but as a worker in many other fields of science as well, the name of Sir William Dawson will always stand prominent in the records of the science in Canada so long as the study of Canadian geology exists. No one who has ever studied carefully that great work on Nova Scotian geology as contained in the last edition of the volume we have mentioned, can fail to be impressed with the immense amount of painstaking research visible throughout. Not only is this seen in the matter of stratigraphical detail, but in the enormous amount of paleontological data there contained. Of the studies of Sir William Dawson of the fossil floras of the great Nova Scotia coal fields, and of the great amount of labor bestowed upon the paleo-botany of the Devonian system of New Brunswick and Gaspé, it need only be said that these remain and are accepted as standard works on these subjects everywhere at the present day. In the pages of "Acadian Geology," also, we find an abundant store of facts pertaining to the character and distribution of the fossils from every formation from the primordial Silurian to the Triassic. His work was not, however, confined to the one province of Nova Scotia. The assistance he was able to render to the local geologists who were beginning to decipher the complicated problems of structure in the adjoining Prov-

ince of New Brunswick was of the greatest value and greatly simplified the difficult task they had undertaken.

In connection, also, with the work in Nova Scotia, we must not omit to mention the names of others who have done great and lasting work in that field. Brown, on the structure of the Cape Breton coal fields, Hind, Howe, Honeyman, and others, of the latter of whom it may be said that probably no man was held in greater esteem by the people of his province. His work in the eastern area, on the Arisaig section, has long since established his reputation as a skilful worker in this field.

In speaking of the work of these pioneers of the science in our sister provinces, there should be no attempt to throw discredit upon their labors or conclusions, even though it be found that the results of the most recent investigations in this field do not in all respects coincide with theirs. It is but fair to infer that, with increased study and more detailed methods of examination, many new facts will be brought to light, which will often of necessity involve changes in the interpretation of structure. This has always been the case, and always will be, so long as the study of geology is carried on, and the principle is as true to-day, as applied to geological work, as it was twenty or thirty years ago.

Passing now to New Brunswick, we find there some names which, as having taken a prominent place in the early study of the science, are well worthy of mention. Among these we again find the name of Gesner prominent, and he may be well styled the father of New Brunswick geology. Following him, we have Dr. John Robb, a former professor in the University of Fredericton, who, in 1849, published valuable notes, and a map of the province, while reference to certain interesting points of structure was made in the first edition of the "Acadian Geology," in 1855. During the early years of its study, from 1840 to 1860, sufficient was not known concerning the areas of crystalline rocks in the southern part of the province to determine their true age or position. The fossiliferous Cambrian slates about St. John had not then been studied with any attempt at detail, only a few imperfect remains having been obtained, which were not determinable, while, from the comparatively isolated condition of the country, opportunities of comparison with the established Huronian and Laurentian rocks of

Canada were not sufficiently afforded to be of much value. At this date, however, 1860, three names come prominently into view in connection with the geology of the province, viz., those of Hartt, Bailey and Matthew. These gentlemen began a careful study of the rock formations about St. John and soon obtained large collections of fossils from various points, many of which were handed to Sir William Dawson for determination, and his papers on the subject form the basis of the second stage of New Brunswick geology.

In 1862-63, Hartt, after a careful study of certain fossils from the St. John slates, discovered the fact that these were the equivalents of those which had been determined by Barrande, in Bohemia, as characteristic of the primordial or earliest known fossiliferous zone. This discovery of Hartt's was of the greatest importance, as establishing a scientific basis for the determination of the sequence of strata. The conclusions then arrived at were published in a small volume issued by Bailey on the geology of the southern part of the province, and, as a result, the crystalline rocks, which resembled in many respects those of the oldest formations in Canada, fell naturally into their proper place at the base of the geological scale, and upon this foundation the superstructure of New Brunswick geology was speedily reared.

The last paper published on the geology of this province, prior to the extension in that direction, of the work of the Geological Survey, was by Prof. H. Y. Hind, in 1865, in which he dealt very fully, not only with the geological structure as a whole, but devoted much attention to the consideration of its mineral resources. In this paper, Prof. Hind instituted some comparisons between the rocks of the interior and those of eastern Quebec, or that portion known as the Quebec group, but differed in some respects from the opinions expressed by Bailey in his volume of the previous year on the southern portion of the province, as to the age of the rocks which had been found to underlie the Cambrian fossiliferous sediments.

The Geological Survey of Canada, whose operations have now been extended to every part of the Dominion, has had an existence of nearly fifty years. While it may seem almost superfluous to devote any time to the history of its inception, it is possible that there may be some present who are not perfectly familiar with the early struggles and dis-

appointments, which attended the efforts of those who were desirous of seeing such an institution in successful operation, and who firmly believed in its great utility as a factor in the advancement of the interests of the provinces. As far back, then, as January, 1832, a petition, asking for pecuniary assistance in carrying on a geological and statistical survey, was presented by Dr. Rae to the Lieut.-Governor of the province, but, though strongly recommended by that gentleman, it was not even entertained by the Committee of Supply. In December of the same year, the York Literary and Philosophical Society also forwarded a petition for the same purpose, which met with a like fate. In 1836, a committee of several gentleman was appointed by the Government to report on a plan for the general survey of the province, which report was presented, but no further action taken in the matter. On motion of the Committee of Supply, it was then resolved that an address should be presented to Sir F. B. Head, the Lieut.-Governor for the time, with reference to the practicability of the desired survey. This, however, failed to go any further, and in December of the same year a Mr. Dunlop gave notice of an address to the King, praying for a grant of wild lands to defray the expenses of a geological survey, which application also met with the same fate as its predecessor, and the matter was thenceforth dropped till the union of the Provinces of Quebec and Ontario and in 1841.

In that year, the Natural History Society of Montreal, through Mr. Benjamin Holmes, and the Literary and Historical Society of Quebec, through Mr. Henry Black, again petitioned for aid to carry out a geological survey. The consideration of these petitions was, therefore, taken up by the Government, and on the motion of the Hon. S. B. Harrison, the sum of £1,500 sterling, for the purposes of such a survey, was included in the estimates. As a result of this action, early in 1842, the advisability of appointing a geologist for the work was considered, and the matter was referred by Sir Charles Bagot, who was the Colonial Governor for the time, to Lord Stanley, then Secretary of State for the Colonies, by whom, on the recommendation of Sedgewick, Murchison, De la Beche and Buckland, the position was offered to Sir William Logan in September of that year.

Logan, who was in England at the time, returned to Canada in the fall and proceeded to Kingston, then the seat of government. Here the question of an assistant was discussed, and, on the recommendation of De la Beche, the services of Mr. A. Murray, a gentleman who had been educated for the navy but who had served for some time on the ordnance survey of Britain, were secured. Murray was already, to some extent, acquainted with Canada, having resided here for several years, and served as a volunteer, also, in the rebellion of 1837. The personal acquaintance of these two men, who have rendered such signal service to this country from a scientific standpoint, began in the winter of 1842-43, and the friendship then established continued unbroken till the death of the former in 1875.

Limited as was the area of Canada fifty years ago, compared with the enormous extent of territory now included under that name, the inception and carrying out of a plan of survey such as Logan contemplated was not a thing to be lightly entered upon or undertaken. Great portions of the country were accessible with difficulty, means of communication were slow and expensive, and the amount of money at his disposal and the staff necessary for the work were lamentably small. With characteristic energy, he addressed himself to the task, and soon formulated a scheme for the carrying on of the explorations required. In the spring of 1843, Logan, who had spent the winter in England, again returned to Canada, reaching Halifax in May, whence he determined to make the journey overland through Nova Scotia, New Brunswick and Quebec, in order to obtain some preliminary ideas as to the structure of that section. It was on this trip that his first work was done in Nova Scotia, and particularly in connection with his famous Joggins section already referred to, of which it has been truly said that "it forms a remarkable monument of his industry and powers of observation." From his previous acquaintance with the rocks and structure of the coal fields of South Wales, Logan was specially fitted to undertake this task, the correct working out of which promised to give him the most satisfactory data for determining the structure and value of the coal fields throughout the rest of that province, as well as of the Carboniferous areas of New Brunswick and eastern Quebec. This great work completed, he spent some time in the examination of the sections

along the south side of the Bay of Chaleur, where, also, thin seams of coal are found, and then proceeded to Gaspé, concerning which reports of the presence of coal had for some years existed, and its determination as a possible coal field was of the very highest importance. Here, in his bark canoe, with a couple of men only, Logan passed some weeks, measuring accurately section after section along the eastern and southern shores of the peninsula, undergoing the usual amount of hardship which such a mode of life entails, and determining very clearly the succession and thickness of the various formations there exposed. The conclusions Logan then arrived at in regard to the value of this so called coal field were to the effect that no deposits of that mineral could ever be found there in workable quantity, and the views then expressed have ever since been accepted as definite, thus preventing the useless expenditure of capital in that direction.

It was fortunate for the early history of this survey that the director should have so thoroughly enjoyed the esteem and confidence, as well as the friendship, of such men as Murchison, Sedgewick and others of the leading geologists of the mother country, by all of whom offers of assistance in all the branches connected with his work were heartily tendered, and without which the elucidation of the particularly knotty problems he everywhere encountered would have been much more difficult.

While Logan was thus devoting his energies to the working out of the structure of Eastern Quebec, Murray, his assistant, had been equally assiduous in his labors in Western Canada, and in the preface to the *Geology of Canada*, 1863, Sir William says that "he (Mr. Murray) has blocked out nearly all that is known of the distribution of the rocks in that division of the Province." In addition to his work in this field, Murray also accompanied Logan on his first great exploration of the Gaspé Peninsula in 1845, during which surveys were made of the Slick-shock range and of most of the larger streams that traverse that section. In Western Ontario the examination of the country about the Great Lakes was particularly arduous, but productive of great results, and the surveys then made of many of the hitherto unexplored streams and portions of the coast remain as standard work to the present day,

thus testifying to the accuracy with which these observations were carried on.

The Geological Survey can now be said to have been fairly launched, though under circumstances not the most satisfactory. Uncertainty as to the continuation of the grant caused Sir William much uneasiness, and there was considerable opposition in certain quarters on the ground that the Survey's work was devoid of practical utility. A liberal policy, however, prevailed, and the sum of £2,000 was voted in the session of 1845-6, thus assuring the carrying on of the work for another season at least. Just at this time, however, Sir William received a very handsome offer from the Directors of the East India Company, in which they tendered him the control of the survey of the Indian coal fields ; but although the direct remuneration promised was treble that he expected to receive as head of the Survey in Canada, so great was the interest he had already acquired in Canadian geology that he decided to continue in his then position even in the face of such adverse circumstances. At his own expense he had meanwhile hired a house in Montreal which served as museum, office and laboratory, and provided himself with a supply of apparatus and chemicals as well as engaged the assistance of a chemist, the result of all which was that at the end of the second year the Survey was in his debt to the amount of about £800. By the act of the Legislature in the ensuing session the sum of £2,000 was granted for a period of at least five years. The bill upon which this grant was made was designed by Sir William himself, and was to the effect that a certain number of competent persons should be appointed, "whose duty it shall be, under the direction of the Governor in Council, to make an accurate and complete geological survey of the Province, and to furnish a full and scientific description of the rocks, soils and minerals, which shall be accompanied with proper maps, diagrams and drawings, together with a collection of specimens to illustrate the same ; which maps, etc., shall be deposited in some suitable place which the Governor in Council shall appoint, and shall serve as a Provincial collection ; and that duplicates of the same, after they have served the purposes of the survey shall be deposited in such literary and educational institutions of the eastern and western divisions of the province as by the same authority shall be deemed most advantageous."

The chemist appointed by Sir William, early in the work, was the Count de Rothermund, a student of the École Polytechnique, Paris. His connection with the official staff was, however, but brief. There appeared to be a lack of ability to grapple with the difficulties presented, or a lack of fitness for the position, which resulted in his voluntary retirement in 1846. The vacancy thus caused was speedily filled by the appointment of Dr. T. Sterry Hunt, who at that date was acting as chemist of the Geological Survey of Vermont. This appointment was a particularly happy one, and for nearly twenty-five years, in his capacity as chemist and mineralogist, Hunt built up, not only for himself, but for the Canadian Survey a reputation which is world-wide.

With the exception of the department of paleontology, the Survey was then comparatively well equipped and ready to carry on in a satisfactory manner the purposes for which it was established. Although the staff was small, the material was of the best, and exploration went forward at a rapid pace. In 1847, Mr. James Richardson was added, and, in course of over thirty years' work, examined many portions of the Dominion from the Straits of Belle Isle to the distant Island of Vancouver and Queen Charlotte's Sound on the confines of Alaska. Other persons were added from time to time, as the necessities of the Survey demanded or the funds at its disposal permitted. In the branch of paleontology it was, however, found necessary for some years to send abroad for determination many of the valuable specimens, which were rapidly accumulating; and among those who particularly rendered assistance in this way may be mentioned Prof. James Hall, of Albany, N. Y., and Messrs. Salter and Jones, of the English Survey. This difficulty was at length overcome by the appointment, in 1856, of Mr. E. Billings, a former resident of this city, whose love for scientific work in this line was such as to lead him to lay aside his chosen profession of the law, and, at the request of Sir William, to attach himself to his small but zealous band of workers. Of him, also, it may be truly said that much of the great reputation the Survey has acquired, both at home and abroad, is due to his indefatigable labours. The appointment of Mr. Robert Barlow, formerly of the Royal Engineers, as chief draughtsman shortly after, completed the official equipment of the staff

at that time. The work of exploration was, however, carried out in the meantime by the employment of specialists who were selected to carry out special examinations of particular mineral locations, and whose reports were of great value, or by what were considered as permanent employees, who carried forward the work along certain regular lines laid down by the director himself. The attempt to give, even in the briefest form, a synopsis of the work of each of these would cause me to trespass on your time to an unwarrantable extent. The particulars of such work will, however, be found summarized in the preface of that great volume, the "Geology of Canada," 1863, in which the leading features of the operations of the Survey to that date are admirably presented.

Among the important changes in nomenclature which owe their origin to the labours of our Canadian geologists of this period, two, at least, are of special interest. The great series of rocks which had been described by leading geologists for many years under the title of *Primary*, or the *Primitive group*, and, for some years prior to 1854, by Logan himself as the *Metamorphic series*, comprising all those which were held to underlie the lowest fossiliferous zone, were, in the report of that year, styled the *Laurentian*, and at the same time, in regard to the palaeozoic formations, the nomenclature of the New York Survey, by which standard these rocks had for many years been classified, was changed to correspond with that employed in the English Survey, and the terms, Lower and Upper Silurian and Devonian came into general use. In the following year, 1855, the great group of rocks which border Lakes Huron and Superior, and which, in the reports of Dr. Bigsby, were styled the *Transition series*, were grouped under the new name *Huronian*. This term was first officially announced in a small volume prepared for the Paris Exhibition of that year and styled "Esquisse Géologique du Canada." The former term, Laurentian, proved so happily chosen that it was subsequently adopted by the English Survey and applied to the great masses of crystalline gneisses and similar rocks which occur on the west coast of Scotland and elsewhere in the British Isles, thus proving in what high estimation the labors of our own geologists were held by the ablest workers in foreign fields.

While the work of the survey during all these years appeared in a regular series of annual reports, the growing interest taken by the general public in its progress, and the apparent necessity for presenting the conclusions arrived at in a more compact form, at length reached such a point that Sir William Logan, assisted by Dr. Hunt, brought out, in 1863, the volume now known as the "Geology of Canada." In this the investigations and results of the preceding twenty years were admirably summed up, and the latest views of structure of all the formations from the Laurentian to the carboniferous clearly stated, both from the standpoint of the stratigrapher and the paleontologist, while the second part contained an immense amount of the most valuable information relative not only to the chemical composition and origin of the various rocks but to the value and distribution of the most important of our economic minerals.

In connection with this volume, and designed to accompany it, the great geological map of Canada and the adjacent Northern States was published in 1866, of which it may be rightly said that no more beautiful work of the kind has ever been presented by this or any other survey; a work entailing an enormous amount of labour, and reflecting the greatest credit upon all engaged in its compilation, and in the delineation of the exceedingly complicated geological lines there laid down. This great work will always stand as the map *par excellence* and can always be pointed to with a feeling of pride, not only by the members of the survey itself, but by every Canadian who feels an interest in the successful carrying out of the study of geological science in our own country. During all these years of hard work in the field by the officers and staff other matters, involving quite as serious labour, were being presented from time to time. The great exhibitions at London, Paris, and Dublin, to which the survey sent large and characteristic collections, both of rocks and minerals, which set forth in a forcible manner the great wealth of the country in this respect, were productive of much good, but involved an immense expenditure of time and energy. The museum and offices at Montreal were constantly visited by scientific men from all parts of the world, who might be passing through, as well as by others seeking information on various points, and from the old workshop on St. James and St. Gabriel streets

much work of the greatest importance in connection with the development of Canada's mineral resources was produced. The confederation of the provinces in 1867 opened new fields for the Survey's operations, and the hitherto somewhat small amounts, granted from time to time, were soon found to be inadequate to carry on the operations over such greatly extended areas. In the meantime the Survey had lost one of its original members in the person of Mr. Murray, who at the request of the Newfoundland Government had undertaken the survey of that colony, a task for which he was especially fitted by his long acquaintance with the rocks of Ontario and Quebec. The staff had gradually been enlarged, but the great strain to which the director had for some years been subjected now began to tell upon him severely, and in 1869 Sir William Logan felt it incumbent upon him, in view of the greatly increased area to which the operations had been extended, and the growing interest he felt in the elucidation of certain highly puzzling problems of structure in eastern Quebec to which he had for many years devoted special attention, to lay aside, as far as possible, the direct charge of the Survey's operations and to seek a successor. His resignation took effect in that year, and with this date, 1869, we may close the second stage of geological investigation in Canada. The position thus rendered vacant was filled by the appointment of Dr. Selwyn, the present director, a gentleman of very extensive experience, not only in the Official Survey of England and Wales, but in the great colony of Australia, where he had for a long period filled the position, also, of director of the Survey of New South Wales. And from this date we enter upon what we may here style our third period.

Hitherto, as already stated, the work had, for the most part, been confined to the two provinces of Quebec and Ontario, in which the great questions of Canadian geology had been most successfully worked out. Henceforth, it had to include in its scope the distant areas of British Columbia, the great plains of the North-west Territory, the rugged masses of the Rocky Mountains, and the wide expanses of the Peace and Mackenzie River basins, concerning all of which, or in great part, at least, our information was of the most meagre kind, not only of its vastness of territory, but of its geological structure, its mineral wealth, its agricultural capabilities, and its natural history and climatic condi-

tions. It can readily be seen, therefore, that the task now entered upon by Dr. Selwyn was one of no small magnitude. In regard to the Northwest and some portion of British Columbia, some work had already been accomplished, both by Prof. Hind, in his exploration of the Saskatchewan plains, and in the great Palliser expedition, by Dr. Hector, and the maps furnished by the latter were for years the only guide by which one could fix his position in that territory with any approach to accuracy. In addition, new and more detailed investigations had, of necessity, to be carried on in the older provinces in connection with the metamorphic and metalliferous rocks, and in the great wilderness country lying between Lakes Huron and Superior and the Hudson and James' Bays, as well as in the eastern provinces of Nova Scotia and New Brunswick. It is, probably, not saying too much, nor, I trust, will it appear to savor of adulation if we state that, probably, no enterprise so great as the complete geological and natural history survey of a country embracing over 3,000,000 square miles was ever undertaken by a staff so small in numbers, or carried on with an expenditure so insignificant, as is being done by this same Geological Survey of Canada. And it is well within the bounds of truth if we say that to the work of the members of its staff is due, in very large part, much of the information we now possess as to the greatness of the country's resources, both agricultural and mineralogical, between the waters of the Atlantic on the east and the distant boundary of Alaska on the north and west. It will scarcely be necessary to mention individual names in this connection. The various members of the staff and their several fields of labor are too well known to require any special personal reference before an Ottawa audience, and as this paper has already reached an undue length, it will doubtless be found sufficient if we indicate briefly and in general terms the extent of the Survey's operations during the last twenty years and give you some of the results already obtained.

Before doing so, however, it must here be mentioned that much work of the greatest practical value has been carried on in various fields by geologists and others not attached directly to the official staff of the Survey but who have been more or less intimately associated with the carrying out of the work in the several provinces. Of these, the names of several have been already mentioned, while, of others, the results of

their labors have appeared from time to time in some one of the various scientific periodicals either of this country or of England and the United States, the results of which it is, for obvious reasons, impossible to allude to further in the brief limits of a paper such as this.

Briefly summarized, then, the progress of geological investigation during the last twenty years may be thus stated. In the east, the carefully detailed maps of Cape Breton and eastern Nova Scotia have been presented to the public and are worthy of the highest praise. We have also, now, a very good general idea of the structure of the other portions of that province, including the distribution of the great gold-bearing series of the coast rocks from Yarmouth on the west to Guysborough on the east. The structure of the great coal fields of Cape Breton, Pictou and Cumberland have also been carefully studied, and the geological horizons of the ores of iron and manganese, which are of the utmost importance in connection with the future development and progress of the country, have been clearly and satisfactorily determined. In New Brunswick and Prince Edward Island, the geological map of both provinces has been completed, and the exceedingly complex questions in the southern portion of the former, which for many years were wrapped in profound mystery, have been very thoroughly solved. The outlines of the great Carboniferous basin, occupying an area of over 12,000 square miles in this province, have been carefully determined, and its presumptive value from the economic point of view established, while some of the most important work in Canada in connection with the paleontology of the oldest fossiliferous formations has been and is still being carried out with the greatest care.

In Quebec east, the great problem of the age and stratigraphical relations of the Quebec group, a problem which for more than forty years has engaged the attention of geologists, not only in Canada, but, to some extent, in the United States and Europe as well, has, it is hoped, been placed on a comparatively satisfactory basis of settlement, while to the west and north of the St. Lawrence, the mysteries of the great region of the Mistassini have been clearly solved, and great progress has been made in the study of the Laurentian rocks to the north between Quebec and Montreal. The great wilderness country lying between the Ottawa and the James' Bay has been traversed in all direc-

tions along the great natural avenues, by which alone this otherwise pathless area can be explored. Concerning the great extent of country about the Hudson and James' Bays, we have now very clear ideas, not only of the geology, but of its fauna and flora and of its adaptability for settlement, while its topography has also been carefully mapped.

In this country the deposits of iron, gold, phosphate, asbestos and copper have also been investigated, and much valuable information furnished as to their mode of occurrence and value.

In Ontario, while a large amount of exploration has been carried on in the older and more settled portions of the province, relating to the more careful delimitation of the better known formations and to the presence of its economic mineral wealth, much careful work of a very high order has also been done in the areas about Lakes Huron and Superior and further west, where some of the great questions as to the age and origin of the fundamental or lowest rocks of our systems are now in a fair way of being conclusively settled, while the geological relations of the great copper-bearing series, always a question of the greatest importance in the study of this section, have received a large amount of attention. In this connection, the great deposits of Sudbury and vicinity have been, of late, especially prominent.

In Manitoba and the North-west, results of the greatest practical value have followed close upon the investigations of the Survey. Among these may be especially mentioned the discovery of the great coal fields along the eastern slopes of the Rocky Mountains and in the Souris plains, a discovery productive of the greatest interest in connection with the development and future welfare of that vast area, as well as the careful study of its flora and climatic conditions and the fitness of great portions for the successful raising of wheat and the finer grains. To this agency, also, we must refer the greater part of our present knowledge as to the character of the country lying to the north of the North Saskatchewan, the presence and prospective value of petroleum-bearing strata there found, and the existence of great and, till very recently, little known tracts of land also well adapted for settlement and the successful prosecution of the various branches of agriculture, a country as yet accessible with difficulty, but which, before many years, will doubtless be traversed by lines of railway, while on the

waters of the mighty Mackenzie and Peace and their great tributaries, as well as on the great inland seas of that great land, suitable steamboat accommodation will present the necessary means of transport, and carry to the outside world the rich harvests which ere long will be produced from the boundless and fertile plains of that district.

In British Columbia, the work of the last twenty years has made us very familiar with the immense value of the coal fields of Vancouver and with the inexhaustible forests which are found, not only in that island, but at many points on the mainland. The mapping of many of the gold fields of the interior has also been done, and the complicated structure of the great Rocky Mountain chain worked out to a very large extent. The presence of mineral deposits in this region has been established, which may be found before long, upon their development, to equal in value those which have of late years enjoyed a world-wide renown and which occur in the prolongation southward of this same mighty range among the western states and territories. Further to the north, we now know well the value of the coal fields of the Queen Charlotte group, and have a fair idea of the extent and resources of the great territory traversed by the Yukon and other rivers, with many facts relative to the distribution of the gold which is found in that section and of its general geological conditions, further particulars of which you will doubtless be privileged to hear during the present lecture course from some of those who, from an intimate personal acquaintance with this field, are best fitted to discuss the subject fully.

In addition to all this work in the departments of geology and mineralogy, the study of the flora and fauna of the country as a whole, has been carried on at many points, extending from the Atlantic to the Pacific, of all of which our knowledge is great and accurate, while, in the kindred science of palaeontology, a reference to the volumes issued during the last fifteen years will serve to show what great strides have also been made in this direction. This is particularly true in connection with the great areas of cretaceous and other closely associated formations which occupy such a wide extent throughout our North-west.

As already stated, the particular history of any one of these fields of investigation would furnish abundant material for a talk of hours instead of minutes. It will, however, I trust, be apparent to all who

have followed this brief sketch that the study of the science of geology in Canada, even though we are a comparatively new country, has not by any means been neglected. Of necessity, in a country so vast, much of the work for years must be largely preliminary, and the conclusions reached be only generalized. The second stage has, however, at many points been reached, when a more careful and detailed study of formations already recognized must be taken up. This will involve the geological relations of our principal minerals and the peculiarities of their modes of occurrence, such as our gold, silver, copper and iron, our asbestos, phosphate, plumbago, manganese, natural gas and petroleum. These are some of the most important economic problems in connection with the science which must now be entered on by the Survey, and the careful consideration and solution of which will, without doubt, constitute factors of the utmost value as concerns the future welfare of our Dominion as a whole.

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GRAY'S MANUAL OF BOTANY.

We are pleased to announce to our botanical members the publication of the new (sixth) edition of Gray's Manual. It has been revised and extended westward to the one hundredth meridian by Dr. Sereno Watson and Prof. J. M. Coulter, with 25 plates illustrating the sedges, grasses, ferns, etc.

This work, which has been anxiously looked for by all working botanists, has only just appeared, too late for review in this number of the NATURALIST, but a notice will appear in the next issue. In the meantime, the editor would remind such of our botanists as may require to get copies that they can do so through Mr. James Hope, who is a member of the Club.

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FIFTH REPORT ON THE INJURIOUS INSECTS OF NEW YORK, BY J. A. LINTNER.

We have to thank Dr. Lintner for a copy of the above valuable contribution to Economic Entomology, which is a report of about 200 pages, illustrated by 50 figures. The chief articles are: Remedies and Preventatives, The Larch Saw-fly, Injurious Lepidoptera, The Grain Aphis, and Miscellaneous Observations. It is a mine of useful information, and contains many carefully prepared and choice gems of knowledge.

J. F.

MONDAY AFTERNOON POPULAR LECTURES.—HOW TO
COLLECT AND PRESERVE BOTANICAL SPECIMENS.

BY JAMES M. MACOUN.

(*Delivered February 3rd, 1890.*)

Until a collector has become fairly well acquainted with a collecting ground he should not attempt the collection of both phænogams and cryptogams at the same time. It is much better to make two expeditions to one locality, collecting flowering plants the first day and mosses, lichens, fungi, etc., on the occasion of a second visit. To do good work with cryptogams it seems necessary to focus the eye especially for them and even the most experienced collectors find it impossible to collect them in a satisfactory manner unless they render themselves practically incapable of seeing a flowering plant at all. As most of you however confine your attention to flowering plants, let us imagine that we are about to set out in search of them. It will be necessary to take out with us nothing but a strong knife and a plant press or vasculum. Except where plants are desired for study or are very tender and require peculiar care in drying, I know of no reason why the vasculum should ever be carried by one who is collecting specimens for preservation, although it will always be preferred by some, and much can be said by them in its favour. Apart from the claims that either party may offer, as regards the superior beauty and quality of specimens that have been collected in the one way over those collected in the other, the one argument that to me seems convincing is that if the press be used in the field the specimen is secured beyond a doubt, while this is by no means certain if the vasculum be employed. Assuming that care has been exercised in the arrangement of specimens in the vasculum, and that the collector has reached home with the results of his day's work in good order, there is still the mechanical and less interesting part of the work to be done—the transfer of the specimens to whatever form of press is used—not infrequently one is too tired to do this at night, and it is postponed until the following morning, when too often one is so hurried that the work cannot be done properly, or perhaps not at all, the bare possibility of this happening is sufficient in my opinion to warrant the disuse of the vasculum altogether by collectors of *specimens*

for the herbarium, as without doubt many fine and rare specimens are lost or spoilt simply because they are neglected after they have been collected.

My plan, as soon as the collecting ground has been reached, is to lay the press on the ground or against a stump or tree, and to collect the plants found in the immediate vicinity: when as many as can be conveniently carried in the hand have been gathered, they are taken to the press, the specimens most worthy of preservation are selected and placed between driers, and the others thrown away. It is important that not only the flower, and where possible the fruit, be collected, but the root also. It may be said that large roots often disarrange the press and the specimens it contains, but there is no need of this. I know of no plant, the root of which may not, with a little trouble, be cut down, so that while its structure may be shown, it will not interfere with the proper drying of the other specimens in the same press. The cutting should all be made from one side, and in the case of bulbous and tuberous plants, or those with tap roots, everything beneath the skin should be carefully cut away, and the specimen will for all herbarium purposes answer as well as if the entire bulb, tuber, or root had been preserved. When using a plant press in the field, no care need be exercised in placing specimens between the driers; much time is often wasted in the endeavor to make specimens remain in just the position that seems best to the collector. If they are placed in the press in the most haphazard manner and submitted to moderate pressure it will be found that after a few hours they will become limp—not withered—and may then be arranged to suit any taste; when put under greater pressure the lines where leaves and blossoms have been bent will disappear. After a day's collecting it is by no means necessary that the plants should at once be transferred to the home press, although the sooner this is done the better, for it should not be forgotten that as soon as driers become saturated, their usefulness is gone. At home a screw or lever press may be used, but a piece of broad board and two or three stones of various weights will answer much better. It is a mistake to use too great pressure, all that is required, is that all parts of the specimen come in contact with the driers, and that the weight be sufficient to prevent wrinkling. What the weight should be depends upon the number

of sheets under pressure. The driers between which specimens have been placed should be changed at least twice a day, until the plants are almost dry, and care should be taken that the papers used for driers should be quite free from moisture; this is best effected by spreading them out where the sun's rays will fall directly upon them, or by placing them in an oven or upon a stove. If specimens are to be dried quickly, two sets of driers should be used and changed every half hour, the driers not in use having in the meantime been thoroughly dried and heated; or the specimens may be placed between thick sheets of blotting paper and dried in a few minutes by means of a hot flat-iron; or after the specimens have been in the press for one day they may be placed between two driers and exposed to the sun. Some species lose their original colour if dried in any of these ways, but their number is small and experience soon teaches one what they are; they are however apt to become brittle, but this difficulty may be obviated with a little care. The specimens should not be made quite dry, but only almost so, and then placed under light pressure for a few hours. Many plants such as the Sedums or Stonecrops, the Cacti, nearly all Orchids and some others are difficult to dry if ordinary methods be employed; they may, however, be made ready for the herbarium in a few hours by simply dipping them in boiling water a sufficient number of times to quite kill them; there is nothing then to be done but to press out the moisture they contain. By this means all plants of a succulent nature are most easily dried.

Potamogetons and kindred water-plants should be placed between masses of paper as soon as taken from the water, and while still wet pressed a little and then transferred to the ordinary driers which need not again be changed.

Vascular Cryptogams such as ferns, equisetums, and club-mosses are collected with flowering plants, as they are of about the same size and dried in much the same manner.

In collecting mosses, lichens, fungi and liver-worts, the vasculum, a basket or even a canvas bag, or large handkerchief may be used; with the exception of fungi all are best when collected shortly after rain has fallen, and are then, too, procured most easily. With the exception of fungi the method of drying all is the same, and is very

simple. Secure fruiting specimens when possible, and after cutting off as much bark, dirt, or rotten wood as is advisable from them, place them between driers, press them slightly and then expose them to the sun until nearly dry, or leave them in a loosely fastened press placed in a small room. Fungi are difficult to dry properly, they should as a general rule be placed gills upward in the sun and will dry in that way in a day or two, but many of them cannot be treated in this way, nor indeed preserved at all.

With all forms of plants the collector should select the best specimens that are to be had when a plant is first seen, and if better are found later on, one should not hesitate to replace, with them, those already collected. While the selection of good specimens in the field is the first important point, care in preserving and drying them is what makes good herbarium specimens. The work in the field may be the most interesting, but it amounts to little more than a health-giving pastime unless the results of the work be preserved in a proper manner.

—:o:—

LIST OF MOSSES COLLECTED IN THE NEIGHBORHOOD OF OTTAWA.

BY JOHN MACOUN, M.A., F.R.S.C., F.L.S.

(Continued from Vol. II, page 272.)

Since the publication of the list of mosses in Vol. II of the Transactions of the Ottawa Field-Naturalists' Club, I have collected the following species:

124. *Sphagnum rubellum*, Wils.—Mer Bleue (Oct., 1889).
125. *Sphagnum cuspidatum*, Ehrh.—Mer Bleue (Oct., 1889.)
126. *Sphagnum intermedium*, Hoffm.—In wet woods north of Beechwood, Ottawa (Oct., 1889).
127. *Sphagnum squarrosum*, Pers.—Quite common in little ponds and wet spots north of Beechwood, Ottawa (Oct., 1889).
128. *Ephemerum serratum*, Hampe, *var. angustifolium*, Schimp.—Not uncommon on overflowed ground at Hull Cemetery and Leamy's Lake (Oct., 1889).

129. *Archidium Ohioense*, Schimp.—With the preceding (Oct., 1889).—New to Canada.

130. *Weisia viridula*, Brid.—On earth on hummocks north of Leamy's Lake near Hull (Oct., 1889).

131. *Dicranum scoparium* var. *scopariiforme*, Kindb.—On roots of trees and logs in McKay's woods and Dow's swamp (Aug., 1889).

132. *Dicranum palustre*, La Pyl.—On earth in Dow's swamp (Sep., 1889.)

133. *Fissidens tamarindifolius*, Brid.—On earth on hummocks and at the base of trees north of Leamy's Lake (Oct., 1889). New to America.

134. *Fissidens pusillus*, Wils.—Very common on flat limestone rocks in McKay's woods; fruiting abundantly (Oct., 1889).—New to America.

135. *Fissidens decipiens*, De Not.—Very common on old stumps and logs in Dow's swamp, and on stones and stumps in McKay's woods (Sep., 1889).

136. *Leptotrichum glauscescens*, Hampe.—On earth close to Hull Cemetery, Leamy's Lake (Oct., 1889).

137. *Orthotrichum speciosum*, Nees.—On trees in all woods around Ottawa (Aug., 1889).

138. *Orthotrichum connectens*, Kindb. (N. sp.)—Habit of *Ulota crispa*. Monœcious. Tufts dense, green above, very radiculose below. Stem 2-12 mm. high. Leaves very *crispate* when dry, revolute nearly all around, papillose, obtuse or obtusate, long-lanceolate, at the base a little broader; the upper cells round, only the basal narrow, the marginal ones not distinct; costa disappearing above, not percurrent. Capsule (not ripe) exserted; calyptra cylindric—narrow, very hairy.—On cedar trees near the pond in Dow's swamp (Sep. 11, 1889).

139. *Encalypta streptocarpa*, Hedw.—Crevices of rocks at the outlet of Leamy's Lake near Hull Cemetery (Aug., 1889).

140. *Physcomitrium immersum*, Sulliv.—On earth on clay banks forming the outlet of Leamy's Lake; very rare (Sep., 1889).—New to Canada.

141. *Webera nutans*, Hedw.—On moist ground and rotten wood in Dow's swamp, and in woods at Leamy's Lake (Aug., 1889).

142. *Webbera cruda*, Schimp.—Crevices of rocks at the outlet of Leamy's Lake (Aug., 1889).

143. *Bryum capillare*, Linn.—In abundance on rocks, Gilmour's Park, Chelsea, Que. (Sep., 1889).

50. *Bryum Ontariense*, Kind. N. sp.—This is the *B. roseum* of first article; fruiting abundantly this year (Aug., 1889).

144. *Mnium affine* *var. rugicum*, Bruch. & Schimp.—On wet, boggy ground near the pond in Dow's swamp (Sep., 1889).—New to Canada.

145. *Mnium inclinatum*, Lindb.—Crevices of limestone rocks at McKay's Lake, and outlet of Leamy's Lake (Aug., 1889).—New to America.

146. *Mnium orthorrhynchum*, Bruch. & Schimp.—Crevices of rocks along McKay's Lake, Beechwood (Oct., 1889).

147. *Polytrichum commune*, Linn.—Common on earth in the wet woods north and west of Beechwood (Aug., 1889).

148. *Myurella julacea*, Bruch. & Schimp. On the base of rotten stumps in Dow's swamp.—Rare.—(Sep., 1889.)

149. *Leskea polycarpa*, Ehrh.—Very abundant on trees subject to inundation in the woods at Leamy's Lake (Aug., 1889).

150. *Leskea nigrescens*, Kindb. N. sp.—On stones in McKay's woods (Oct., 1889).

151. *Pylaisia Selwynii*, Kindb. N. sp.—On old rails along the Richmond road (Aug., 1884).—Mixed with *P. intricata*.

152. *Hypnum* (*Brachythecium*) *acuminatum*, Beauv.—Common on earth and at base of trees in Beechwood and at Carleton Place (Sep., 1889).

153. *Hypnum* (*Brachythecium*) *acutum*, Mitt.—On stones in McKay's woods, and at Carleton Place (Sep., 1889).

154. *Hypnum* (*Brachythecium*) *Donnellii* (?) Austin.—On roots of trees in woods at Carleton Place (Sep., 1889).—New to Canada.

155. *Hypnum* (*Brachythecium*) *Novae-Angliae*, Sulliv. & Lesq.—On earth in McKay's woods (Aug., 1889).

156. *Hypnum* (*Brachythecium*) *populeum*, Hedw.—On rocks in Gilmour's Park, Chelsea, and at Carleton Place (Sep., 1889).

157. *Hypnum* (*Eurhynchium*) *substrigosum*, Kindb. N. sp.—Differing from *H. strigosum* in the leaves, being twice greater, subdistichous,

long—decurrent ; branches complanate, the immature capsule very much constricted under the orifice ; cilia appendiculate : inflorescence monocious.—On old logs by pools of water in woods north of Beechwood (Oct. 12, 1889).

158. *Hypnum* (*Rhynchostegium*) *serrulatum*, Hedw.—On the ground in McKay's woods and at Carleton Place (Sep., 1889).

159. *Hypnum* (*Plagiothecium*) *Passaicense*, Lesq. & James.—Abundant on the base of cedar trees and stumps in Dow's swamp (Sep. 11, 1889).

160. *Hypnum* (*Amblystegium*) *varium*, Beauv.—On earth, decayed wood and stones in McKay's woods, and at Carleton Place (Sep., 1889).

161. *Hypnum* (*Amblystegium*) *porphyrrhizon*, Lindb.—On stones and earth in wet woods at Ottawa and Carleton Place (Sep., 1889).

162. *Hypnum* (*Amblystegium*) *Zuratski*.—On stones and earth in woods at Carleton Place (Sep., 1889).

163. *Hypnum* (*Amblystegium*) *fluviale*, Swartz.—On stones in the brook that discharges from Kingsmere near Chelsea, and in a brook at Carleton Place (Sep., 1889).

164. *Hypnum* (*Amblystegium*) *subtile*, Hoffm.—Abundant on the trunks in woods at McKay's Lake (Oct., 1889).

165. *Hypnum* (*Campylium*) *Sommerfeltii*, Myrin.—On the ground at the roots of trees at Rockcliffe (Aug., 1889).

166. *Hypnum* (*Harpidium*) *fluitans*, Linn.—In the marsh at McKay's Lake, and rear of Beechwood (Oct., 1889).

167. *Hypnum* (*Harpidium*) *aduncum*, *var. platyphyllum* (N. var.), Kinb.—On stones in damp woods at Rockcliffe (Aug., 1889).

168.—*Hypnum* (*Ctenidium*) *molluscum*, Hedw.—On old logs in Dow's swamp and rear of Beechwood (Sep., 1889).

169. *Hypnum* *subimponens*, Lesq. (?)—On logs in woods at Carleton Place (Sep., 1889).

170. *Hypnum* *curvifolium*, Hedw.—In wet woods in rear of Beechwood Cemetery (Oct., 1889).

171. *Hypnum* (*Calliergon*) *giganteum*, Schimp.—In wet, springy places, Dow's swamp (Sep., 1889).

172. *Hypnum* (*Calliergon*) *Richardsoni*, Lesq. & James.—In the marsh at the head of McKay's Lake (Oct., 1889).

173. *Hypnum* (*Calliergon*) *Schreberi*, Willd.—Quite common under pine trees in McKay's woods, and in Gilmour's Park, Chelsea (1889).

CANADIAN GEMS.

A neat little pamphlet entitled "A Catalogue of Mineralogical Gems," printed by the *Citizen Co.*, has just been laid upon our table, and is issued by the new firm of C. P. Willimott & Co., of this city. From this pamphlet we learn that we have in our midst facilities, not before enjoyed, both for the cutting and polishing of gems not only from Canadian sources but from all parts of the world. There has long been an idea amongst most people that our Canadian minerals did not furnish material suitable for the purpose, but a glance at the list shows us that amongst our native gems we have many kinds which, when properly cut, furnish stones of great beauty and value.

In addition, this firm also undertakes the preparation of rock sections for microscopical examination, thus doing away with the necessity which has heretofore existed of sending abroad to Germany or the United States for this kind of work.

Characteristic collections of Canadian minerals will also be made and kept in stock, both suitable for private parties and for scientific educational institutions. These will be of great value, not only to the private collector and those engaged in prospecting, but to all interested in or devoted to the work of teaching mineralogy. These collections are of different sizes and prices, ranging from \$1 each upwards, the price depending on the number and value of the specimens contained.

A visit to their workshop on Wellington street, where a large collection of cut gems is kept in stock ready for mounting, will amply repay anyone who may desire anything in this line, while the various polished slabs of Agate, Labradorite, etc., together with the display of neatly arranged collections and unique crystals, will be of great interest to most persons.

We congratulate this young firm upon the amount of push and energy requisite to the establishment of such an enterprise, and from our personal knowledge of the members of the firm, we not only wish them every success, but feel that they will give every satisfaction to any of our readers who may require anything in their line.

J. F.

A RARE BUTTERFLY (*Erebia discoidalis*, Kirby).

Two beautiful specimens of this butterfly, one of the rarest in the Canadian fauna, have been received from Mr. John D. Evans, who collected them at Sudbury, on the Canadian Pacific Railway, on 12th May last.

The species was described by Kirby (Fauna Boreali-Americana, IV, p. 298, pl. 3, figs. 2, 3, 1837) from Cumberland House, lat. 54°. In 1863, several examples were taken at Fort Simpson, Mackenzie River, by Mrs. Christina Ross, and sent to Mr. W. H. Edwards, together with the types of *Colias Christina*, which latter was named after the collector. Specimens were also sent from Hudson Bay to Mr. Hermann Strecker. In 1889, one specimen was again sent out from Fort Simpson, which had been taken by Mr. Frederick Bell, in the end of June, 1888. Last summer, specimens were collected near Fort Qu'Appelle, N. W. T., by Mrs. Cora E. Rose (Can. Ent. XXI, p. 238). The most interesting locality of all, however, is that now discovered by Mr. Evans, in Ontario, at Sudbury. He took five specimens in a short time upon the same day, which would indicate that they were in some abundance. Nothing is known of the preparatory stages, but now, on account of the comparative accessibility of Sudbury, and the readiness with which the butterflies of grass-feeding caterpillars deposit their eggs, there is every chance that the life history of this rare insect will be worked out. The perfect insect is figured and described by Mr. W. H. Edwards in his Butterflies of North America, Series III, pt. vii.

J. F.

PUBLICATIONS RECEIVED.

The following publications have been received during the year, by gift or in exchange, for which the thanks of the Council are tendered to the donors, who are respectfully requested to accept this in lieu of other acknowledgment.

PERIODICALS.

- Auk, The : (Organ of the American Ornithologists' Union).
 Botanical Gazette.
 Bulletin of the Torrey Botanical Club.
 Boston Society of Natural History—Proceedings.
 Canadian Entomologist.
 Canadian Record of Science.
 Cincinnati Society of Natural History—Journal.
 Cornell University, Agricultural Experiment Station—Bulletin.
 Conchologist's Exchange.
 Entomologica Americana.
 Essex Naturalist.
 Geological Survey of Canada—Report, 1887-8.
 Insect Life. From U. S. Dep. of Agriculture.
 Johns Hopkins University—Circulars.
 Journal of Mycology. From U. Dep. of Agriculture.
 Journal of Comparative Medicine and Surgery.
 Kansas Academy of Sciences—Transactions, 1887-8.
 K. Svenska Vetenskaps—Akademiens—Bihang 3 and 4.
 Manitoba Historical and Scientific Society—Transactions.
 Nautilus : (Conchological).
 Naturwissenschaftliche Wochenschrift.
 Natural History Society of New Brunswick—Bulletin.
 Natural Science Association of Staten Island—Proceedings.
 Nova Scotian Institute of Natural Science—Proceedings.
 New York Microscopical Society—Journal.
 New York State Entomologist—Fifth Report.
 Ornithologist and Oölogist.
 Ormerod, Miss E. A.—Report on Injurious Insects, 1888.
 Ohio Agricultural Experimental Station—Bulletins.
 Ontario Fruit Growers' Association—Report, 1888.

Psyche : (Entomological).

Université Laval—Annuaire, 1889–90.

United States Geological Survey—Monographs XIII and XIV—
Bulletins 48 to 53.

Weather Review (Meteorological Service of Canada), and Report,
1886.

Wisconsin Academy of Sciences—Transactions, 1883–7.

OTHER PUBLICATIONS.

American Ornithologists' Union—Supplement to Check List of N.
A. Birds.

Fletcher, James—A Trip to Nepigon : (Entomological).

Honeyman, Rev. D.—(1) Nova Scotian *Echinodermata*. (2) Two
Cable Hauls of Marine Invertebrates.

Miller, S. A.—North American Geology and Palæontology.

Ormerod, Miss E. A.—Notes of Injurious Insects of South Africa.

Smith, John B.—(1) *Noctuidæ* of Temperate North America. (2)
Revision of Species of *Oncocnemis* (three papers). (3) Preliminary
Catalogue of *Arctiide* of Temperate North America. (4) Report of
Meeting of Association of Economic Entomologists.

Smithsonian Institution—Reports of Secretary, 1866 to 1872, and
1874 to 1876.

United States Department of Agriculture—The Root-knot Disease.

Vasey, Dr. G.—Agricultural Grasses of the United States.

Whiteaves, J. F.—Contributions to Canadian Palæontology, Vol.
I, Pt. II (2, 3 and 4).

Williams, H. S.—(1) Fossil Faunas of the Upper Devonian. (2)
New Crinoids from Rocks of the Chemung Period (N.Y.) (3) On a
Crinoid with Moveable Spines. (4) On the Different Types of the
Devonian System in North America. (5) Comparison of the Muscles
of Chelonian and Human Shoulder-girdles. (6) Undulations of Rock
Masses across Central New York. (7) *Lamellibranchiata* and Species-
making. (8) On the Classification of the Upper Devonian. (9) The
Ideal Modern Scholarship. (10) Methods of Instruction in General
Geology. (11) Geographical and Physical Conditions, as Modifying
Fossil Faunas. (12) Fossils of the Upper Devonian (Genesee Section).
(13) Synopsis of a Course of Lectures on the Elements of Historical
Palæontology. (14) Report of the Sub-Committee on the Upper Palæo-
zoic. (15) Channel Fillings in the Upper Devonian Shales. (16) On
the Occurrence of *Proëtus longicaudus*.

BOOK NOTICE.

PROCEEDINGS OF THE ORNITHOLOGICAL SUB-SECTION OF THE BIOLOGICAL SECTION OF THE CANADIAN INSTITUTE FOR THE YEAR 1889.

This interesting pamphlet, published under the editorship of Mr. Ernest E. Thompson, is extracted from the Proceedings of the Canadian Institute, of Toronto. It will well repay a careful perusal by any student of birds, containing, as it does, a large number of notes of the arrival and departure, and of the breeding, feeding and other habits of birds, the majority of which are to be found here as well as there. Besides this, there are many notes of the occurrence of rare birds, and of birds not found in this locality, but which, perhaps, in consequence of an extension of *habitat*, may be found here at some time in the near future. Among these last, the Yellow-billed Cuckoo (*Coccyzus americanus*) is now found to be "a regular, though far from common, summer resident" at Toronto, whereas it was formerly considered but an accidental straggler. The capture of the Razor-billed Auk (*Alca torda*), on Toronto Bay, on December 10, proves that the ornithological field can never, with safety, be said to be completely worked out in any given locality. The wintering of the American Goldfinch (*Spinus tristis*) and the Crow (*Corvus americanus*) in 1888-89 are interesting as corresponding with our experience here. One pair of the latter species, at least, has spent the winter here, regularly, for several years, feeding at a slaughter-house not far from the city limits. The taking, at Toronto, of several species of hawks, with their stomachs full of grasshoppers, will add further weight to the impression, which, fortunately, is gaining ground steadily, that these birds are the friends, and not the enemies of the farmer. We earnestly commend the pamphlet to the attention of our ornithological readers.

W. A. D. L.

ERRATA.—In the list of new members in the last number of the NATURALIST, p. 116, for "J. Rainson Wills" read "J. Lainson Wills, M.E., F.C.S.

In the instalment of "Flora Ottawaensis" issued with same number, the pages should be numbered from 62 to 69 instead of from 121 to 128.

NEW MEMBERS.—John Law; Willibert Simpson; Miss Steacy.

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